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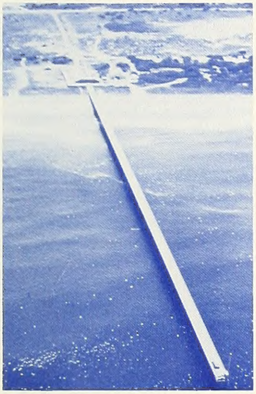

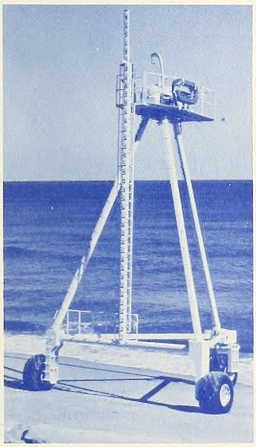

GB 450 .T45 no. CERC-86-11

TECHNICAL REPORT CERC-86-11

ANNUAL DATA SUMMARY FOR 1984 CERC FIELD RESEARCH FACILITY

by

Herman C. Miller, William E. Grogg, Jr., Michael W. Leffler, C. Ray Townsend III, Stephen C. Wheeler

Coastal Engineering Research Center

DEPARTMENT OF THE ARMY
Waterways Experiment Station, Corps of Engineers
PO Box 631, Vicksburg, Mississippi 39180-0631

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November 1986

Final Report

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Unclassified
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188 Exp. Date: Jun 30, 1986

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) Technical Report CERC-86-11	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION See reverse 6b. OFFICE SYMBOL (If applicable) WESCV	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) PO Box 631 Vicksburg, MS 39180-0631	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION US Army Corps of Engineers 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code) Washington, DC 20314-1000	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
Annual Data Summary for 1984, CERC Field Research Facility

12. PERSONAL AUTHOR(S)
Miller, Herman C., Grogg, William E., Jr., Leffler, Michael W., (Continued)

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final report	FROM ____ TO ____	November 1986	220

16. SUPPLEMENTARY NOTATION
Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Atlantic Ocean Meteorology, Maritime Ocean waves Statistics

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This report provides basic data and summaries for the measurements made during 1984 at the US Army Engineer Waterways Experiment Station (WES) Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) in Duck, N. C. The report includes comparisons of the present year's data to prior years and cumulative statistics from 1980 to the present.

Summarized in this report are meteorological and oceanographic data, monthly bathymetric survey results, samples of quarterly aerial photography, and descriptions and hourly data for 14 storms that occurred during the year. Wave conditions were slightly lower than average with the fewest storms since 1980. The year was highlighted by the close passage of hurricanes Isidore in September and Josephine in October.

(Continued)

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code) / 22c. OFFICE SYMBOL

DD FORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

MBL/WHOI
0 0301 0091255 6

6a. NAME OF PERFORMING ORGANIZATION (Continued).

USAEWES
Coastal Engineering Research Center

12. PERSONAL AUTHOR(S) (Continued).

Townsend, C. Ray, III, Wheeler, Stephen C.

19. ABSTRACT (Continued).

This report is the sixth in a series of annual summaries of data collected at the FRF. Data collected from 1977-1979 were published as CERC Technical Report 82-16; data from 1980 to 1983 were published as CERC Technical Reports 84-1, 85-3, 86-5, and 86-9, respectively. These reports are available from the WES Technical Report Distribution Section of the Technical Information Division, Vicksburg, Miss.

PREFACE

Data and data summaries presented herein were collected during 1984 and compiled at the US Army Engineer Waterways Experiment Station (WES) Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) in Duck, N. C. This report is the sixth in a series of annual FRF data summaries carried out under CERC's Waves and Coastal Flooding Program.

The report was prepared by Herman C. Miller, Oceanographer, under the supervision of Curt Mason, Chief, FRF Group, Engineering Development Division. Michael W. Leffler, Civil Engineering Technician, assisted with data collection and analysis; William E. Grogg, Jr., Electronics Technician, assisted with instrumentation; and Stephen C. Wheeler, Computer Specialist, and C. Ray Townsend III, Amphibious Vehicle Operator, assisted with data collection. Dr. James R. Houston and Mr. Charles C. Calhoun, Jr., were Chief and Assistant Chief, respectively, of CERC. Dr. William L. Wood, former Chief, and Mr. Thomas W. Richardson, Chief, Engineering Development Division, provided general guidance.

The National Oceanic and Atmospheric Administration/National Ocean Service maintained the tide gage and provided statistics for summarization.

In addition, a special thank you is extended to William A. Birkemeier, Hydraulic Engineer, for his supervision of the FRF surveying program.

COL Allen F. Grum, USA, was the previous Director of WES. COL Dwayne G. Lee, CE, is the present Commander and Director. Dr. Robert W. Whalin is Technical Director.

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LIST OF FIGURES

CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

Multiply	By	To Obtain
acres	4,046.873	square metres
feet	0.3048	metres
millibars	100.0	pascals
miles (US statute)	1.609347	kilometres

ANNUAL DATA SUMMARY FOR 1984

CERC FIELD RESEARCH FACILITY

PART I: INTRODUCTION

1. The US Army Engineer Waterways Experiment Station (WES) Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) located on 176 acres* at Duck, N. C. (Figure 1), consists of a 561-m-long research pier, an accompanying office, and field support buildings. The FRF is near the middle of Currituck Spit along a 100-km unbroken stretch of shoreline extending south from Rudee Inlet, Va., to Oregon Inlet, N. C. The FRF is bordered by the Atlantic Ocean to the east and Currituck Sound to the west. The Facility is designed to (a) provide a rigid platform from which waves, currents, water levels, and bottom elevations can be measured, especially during severe storms; (b) provide CERC with field experience and data to complement laboratory and analytical studies and numerical models; (c) provide a manned field facility for testing new instrumentation; and (d) serve as a permanent field base of operations for physical and biological studies of the site and adjacent region.

2. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The piles are embedded approximately 20 m below the ocean bottom. The pier deck is 6.1 m wide and extends from behind the dune line to about the 6-m water depth contour at a height of 7.8 m above National Geodetic Vertical Datum (NGVD). The pilings are protected against sand abrasion by concrete erosion collars and against corrosion by a cathodic system.

3. An FRF Measurements and Analysis program has been established to collect basic oceanographic and meteorological data at the site, reduce and analyze these data, and publish the results.

4. This report is the sixth in a series of annual reports and summarizes the data collected during 1984. Data for previous years are summarized by Miller (1982 and 1984) and Miller, et al. (1985, 1986a, and 1986b). Descriptions of the instrumentation, including sensor calibration and

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* A table of factors for converting non-SI units of measurement to SI (metric) units is presented on page 10.

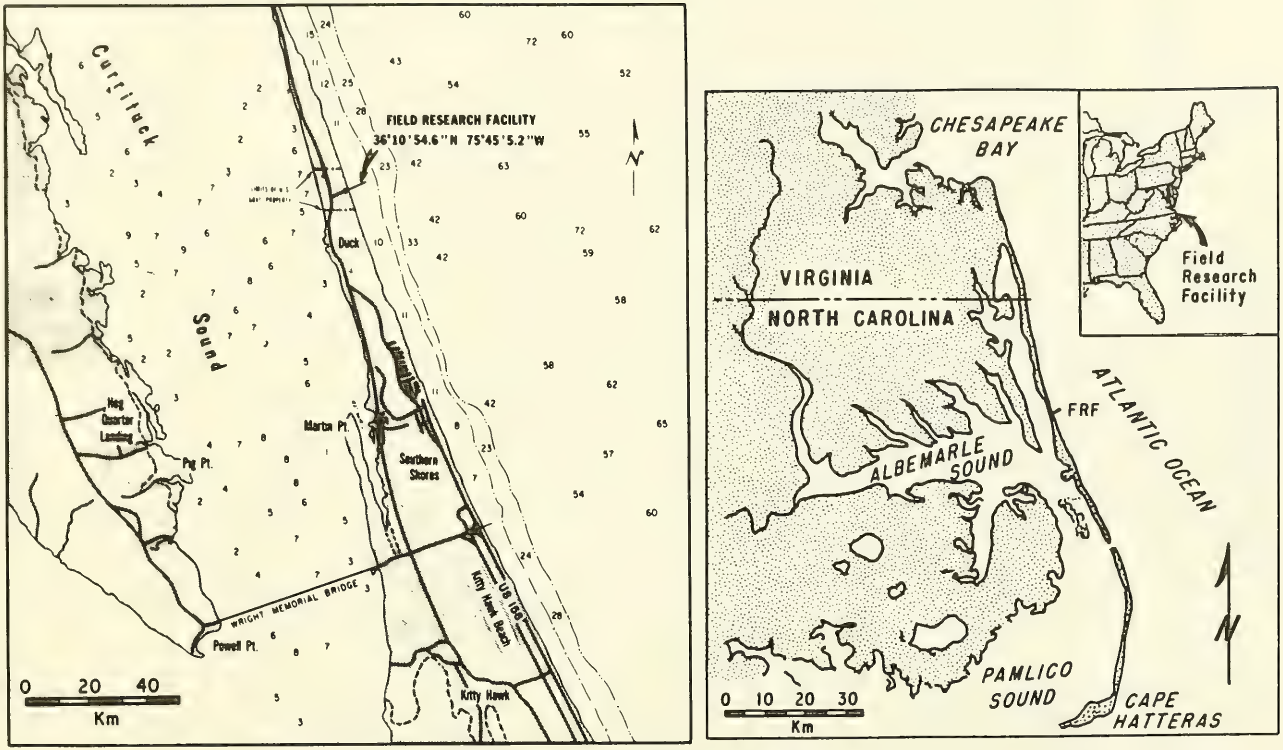


Figure 1. FRF location map

maintenance (Part III) and data collection and analysis procedures (Part IV), precede reporting of the data (Parts V and VI). Appendix A is a detailed explanation of how to use the Waverider buoy calibration information to improve the accuracy of the wave measurements. Appendix B has extensive wave data, Appendix C has bathymetric data, and Appendix D has storm data. Although this is intended to be a self-contained document, details for some procedures and instrumentation are given in the references.

5. Future annual reports will be of approximately the same format; readers' comments on the format and usefulness of the data presented are encouraged.

6. In addition to the annual reports, monthly Preliminary Data Summaries (CERC/FRF 1984) containing the same types of data are available shortly after the data are collected from the following address:

Chief
CERC Field Research Facility
SR Box 271
Kitty Hawk, NC 27949

7. Although the data collected at the FRF are designed primarily to support ongoing CERC research, use of the data by others is encouraged. The WES/CERC Coastal Engineering Information and Analysis Center (CEIAC) is responsible for storing and disseminating most of the data presented or alluded to in this report. All data requests should be in writing and addressed to:

Commander and Director
US Army Engineer Waterways Experiment Station
ATTN: CEIAC
PO Box 631
Vicksburg, MS 39180-0631

Tidal data other than the summaries in this report should be obtained directly from the following address:

NOAA/National Ocean Service
ATTN: Tide Analysis Branch
Rockville, MD 20852

A complete explanation of the exact data desired for specific dates and times will expedite filling any request; an explanation of how the data will be used will help CEIAC or National Ocean Service (NOS) determine if other relevant data are available. For information regarding the availability of data, contact CEIAC at (601) 634-2017. Costs for collecting, copying, and mailing will be borne by the requester.

PART II: CLIMATOLOGICAL SUMMARY

Climate

8. The FRF enjoys a typical marine climate which moderates the extremes of both summer and winter. During the warmest months, July and August, the monthly air temperature averaged over 25° C. Correspondingly, ocean water surface temperatures tend to be highest during July through September, averaging over 20° C. Lowest air and water temperatures are during February, averaging less than than 8° C and 5° C, respectively.

9. Precipitation is generally well distributed throughout the year, averaging 1,061 mm annually. Frontal precipitation from midlatitude cyclones predominates in the winter, and local convection (thunderstorms) accounts for most of the summer rainfall.

10. Winds at the FRF are dominated by tropical maritime air masses which create low to moderate, warm southern breezes; arctic and polar air masses which produce cold winds from northerly directions; and smaller scale cyclonic, low pressure systems, which originate either in the tropics (and move north along the coast) or originate inland (and move eastward offshore). The dominant wind direction changes with the season, being generally from northern directions in the fall and winter and from southern directions in the spring and summer. The annual resultant wind direction is from the north-northwest. It is common for fall and winter storms (northeasters) to produce winds with average speeds in excess of 15 m/sec. Although the portion of the North Carolina coast in the vicinity of the FRF experiences a fairly low frequency of occurrence of direct hurricane strikes (on the average of once every 42 years), more frequent near-misses can cause high wave conditions at the FRF.

Waves

11. Wave directions at the FRF, as with winds, are seasonally distributed. Waves tend to approach most frequently from north of the pier in the fall and winter and south of the pier in the summer, but on an annual basis they are approximately evenly distributed between north and south (resultant

wave direction is almost shore-normal). However, storm waves approach twice as frequently from north of the pier.

12. The annual mean wave height (measured at the seaward end of the FRF pier) is 0.9 m, with a standard deviation of 0.6 m. Wave heights in excess of 2 m can be expected to occur 7 percent of the time, or 600 hr per year.

13. Wave periods generally vary between 6 and 12 sec with an annual mean peak spectral period of 8.8 sec and a standard deviation of 2.8 sec. Wave periods tend to be longest during the fall and shortest during the summer.

Nearshore Currents

14. Surface current speed and direction at the FRF are influenced by winds, waves, and, indirectly, by the bottom topography. The extent of the respective influence varies daily. However, winds tend to dominate the currents at the seaward end of the pier, while waves dominate within the surf zone. The effect of the bottom topography is such that, under certain conditions (e.g., near shore-normal wave angles), rip currents develop which interrupt the general flow of the alongshore current. A trough located under the seaward half of the pier is a preferred location for such currents. Currents tend to be southward during fall and winter and northward during spring and summer.

Tides and Water Levels

15. Ocean tides at the FRF are semidiurnal, with a mean range of 1.0 m. The highest water levels generally are associated with strong and persistent onshore winds and high waves. Storm surges have resulted in a maximum water level of 1.5 m above the NGVD. Water levels in Currituck Sound are wind-dominated rather than tidal, being low when winds are northerly and high when winds are southerly.

Bathymetry

16. Nearshore bathymetry at the FRF is characterized by regular shore-parallel contours, a moderate slope, and a barred surf zone (usually an outer

storm bar in water depths of about 4.5 m and an inner bar in water depths between 1.0 and 2.0 m). This pattern is interrupted in the immediate vicinity of the pier where a trough runs under much of the pier's length, ending in a scour hole at the pier's seaward end where depths are up to 3.0 m greater than the adjacent bottom.

Sediment Size

17. Dune sediments are generally composed of medium size sand and are moderately to well sorted. On the beach face and the beach step, size distribution is primarily bimodal, with a very coarse (1-2 mm) gravel intermixed with fine to moderate size sand. Offshore, sediments are well sorted, and size decreases with the distance offshore.

PART III: INSTRUMENTATION

18. This part identifies the instruments used for monitoring oceanographical and meteorological conditions and briefly describes their design, operation, and location. More detailed explanations of the instruments may be found in Miller (1980). Equipment used for other types of data collection, such as the surveying system, are not generally discussed; however, references are provided in Part IV.

Meteorological Instruments

Air temperature

19. A Yellow Springs Instrument Company, Inc. (YSI), Yellow Springs, Ohio, electronic temperature probe with analog output interfaced to the FRF's Data General NOVA-4 computer was operated beside the National Weather Service's (NWS's) meteorological instrument shelter located 43 m behind the dune (Figure 2). To ensure proper temperature readings, the probe was installed 3 m above ground inside a "coolie hat" to shade it from direct sun yet provide proper ventilation.

Maximum/minimum thermometers

20. Maximum and minimum thermometers housed in the shelter were used to determine the daily extreme air temperatures. The shelter was designed with louvered sides, a double roof, and a slatted bottom for housing instruments requiring protection from direct sunlight.

21. The actual temperature readings at the time the thermometers were read were compared to ensure accuracy of the maximum and minimum values. Maintenance consisted of the periodic removal and cleaning of the thermometers with soap and water and lubricating the Townsend support used to hold and reset the instruments.

Atmospheric pressure

22. Atmospheric pressure was measured with a YSI electronic sensor with analog output. The sensor was located in the laboratory building at 9 m above NGVD, and data were recorded on the FRF computer. Data from this sensor were compared with a NWS aneroid barometer at least once a week to ensure proper operation of the instruments.

Figure 2. FRF gage locations

23. A recording aneroid sensor (microbarograph) located in the laboratory building was also used to continuously record atmospheric pressure variation. The microbarograph was manufactured by Weathertronics Incorporated, Sacramento, Calif.

24. The microbarograph was compared daily with the NWS's aneroid barometer, and adjustments were made as necessary. Maintenance of the microbarograph consisted of inking the pen, changing the chart paper, and winding the clock every 7 days. During the summer, a meteorologist from the NWS (Norfolk, Va.) checked and verified the operation of the barometer.

Rain gage

25. A 30-cm weighing rain gage manufactured by the Belfort Instrument Company, Baltimore, Md., measured daily precipitation. It was located near the instrument shelter 46 m behind the dune. The manufacturer's specifications indicated that the instrument accuracy was 0.5 percent for precipitation amounts less than 15 cm and 1.0 percent for amounts greater than 15 cm.

26. A 15-cm-capacity "true check" clear plastic rain gage with a 0.025-cm resolution, manufactured by the Edwards Manufacturing Company, Alberta Lea, Minn., was used to monitor the performance of the weighing rain gage. This gage, located near the weighing gage, was checked daily; very few discrepancies were identified throughout the year.

Wind speed and direction

27. Winds were measured from the top of the laboratory building at an elevation of 19.1 m (Figure 2) by using a Skyvane Model W102P anemometer manufactured by the Weather Measure Corporation, Sacramento, Calif. Wind speed and direction data were incorporated into the automated data collection and analysis program and were also collected continuously on a strip-chart recorder. The Weather Measure Corporation specifies an accuracy of ±0.45 m/sec below 13 m/sec and 3 percent at speeds above 13 m/sec, with a threshold of 0.9 m/sec. Wind direction accuracy is ±2 deg with a resolution of less than 1 deg. The anemometer was calibrated semiannually at the National Bureau of Standards in Gaithersburg, Md., and was within the manufacturer's specifications.

Wave Gages

Baylor wave staff gages

28. Two parallel cable inductance wave gages, manufactured by the Baylor Company, Houston, Tex., were mounted on the FRF pier: gage 615 at sta 6+20 and gage 625 at sta 19+00 (Figure 2). These gages are rugged and reliable, and require little maintenance except to keep tension on the cables and to remove any material which may cause an electrical short between them. These gages were calibrated prior to installation by creating an electrical short between the two cables at known distances along the cable and recording the voltage output. Electronic signal conditioning amplifiers are used to ensure that the output signals from the gages are within a 0- to 5-V range. Gage accuracy is about 1 percent, with a 0.1 percent full-scale resolution; full scale is 9.4 m for gage 625 and 8.5 m for gage 615. These gages are susceptible to lightning damage, but protective measures have been taken to minimize such occurrences. A more complete description of the gage's operational characteristics is given by Grogg (1986).

Waverider buoy wave gage

29. A Waverider buoy gage (620) was located 3 km offshore. This gage was manufactured by the Datawell Laboratory of Instrumentation, Haarlem, The Netherlands, and measures the vertical acceleration produced by the passage of a wave. The signal is double-integrated to produce a displacement signal which is transmitted by radio to an onshore receiver. The manufacturer states that wave amplitudes are correct to within 3 percent of their actual value for wave frequencies between 0.065 and 0.5 Hz (15- to 2-sec wave periods). However, calibration curves for one of the two buoys used indicate that the wave heights reported in Part V of this report, for wave periods less than 15 sec, average about 7 percent less than actual values. For wave periods greater than 15 sec, this error increases with wave period. The manufacturer specifies the error can increase to 10 percent for wave periods greater than 20 sec. Calibration results show errors as large as 15 percent are possible for the very long wave periods. The buoys were calibrated without the mooring system used during deployment, which may introduce additional errors of unknown magnitude. For most engineering applications, a 7 percent error is tolerable; however, a correction procedure is described in Appendix A, which will allow the calibration error to be improved up to 4 percent.

Tide Gage

30. Water level data were obtained from a NOAA/NOS control tide station (No. 865-1370) located at the seaward end of the research pier (Figure 2), by using a digital tide gage manufactured by Leupold and Stevens, Inc., Beaverton, Oreg. The Leupold-Stevens analog-to-digital recorder is a float-activated, negator-spring, counterpoised instrument that mechanically converts the vertical motion of a float into a coded, punched paper tape record. The below-deck installation at pier sta 19+60 consisted of a 30.5-cm-diam stilling well with a 2.5-cm orifice and a 21.6-cm-diam float.

31. This tide gage was checked daily for proper operation of the punch mechanism and for accuracy of the time and water level information. The accuracy was determined by comparing the gage level reading with a level read from a reference electric tape gage. Once a week, a heavy metal rod was lowered down the stilling well and through the orifice to ensure free flow of water into the well. During the summer months, when biological growth was most severe, divers inspected and cleaned the orifice opening as required.

32. The tide station was inspected quarterly by a NOAA/NOS tide field group. The tide gage elevation was checked using existing NOS control positions, and the equipment was checked and adjusted as needed. NOS and FRF personnel also reviewed procedures for tending the gage and handling the data. Any specific comments on the previous months of data were discussed to ensure data accuracy.

PART IV: DATA COLLECTION AND ANALYSIS

Data Acquisition System/Digital Data Collection

33. The primary data acquisition system was a Data General Corporation (Westboro, Mass.) NOVA-4 minicomputer located in the FRF laboratory building. The backup system consisted of a WICAT Systems Incorporated, Orem, Utah, 150 WS minicomputer. Signals from the air temperature and atmospheric pressure sensors, the anemometer, and wage gages were routinely sampled four times per second for 20 min every 6 hr beginning at or about 0100, 0700, 1300, and 1900 hr Eastern Standard Time (EST); these hours correspond to the time that the NWS creates daily synoptic weather maps. During storms, hourly data recordings were made. Prior to collection, each gage signal was first amplified and biased to ensure a 0- to 5-V range.

34. Data were recorded on nine-track magnetic tapes having the following format: first, two header records of information were written, which include (a) the sensor identification number; and (b) the date, time, calibration, and signal bias factors, followed by 13 records of data for each 20-min recording interval. Each data record contained 384 data values in a binary format, such that each value represented the computer units corresponding to the instantaneous voltage output of the sensor. The above sequence of 15 records per file was repeated for each sensor and recording interval until the data tape was filled, a total of 600 to 700 files per tape.

Meteorological Data

Collection

35. Maximum and minimum temperatures. High and low temperature values were read daily directly from the instruments and represent the extreme temperature values since the last reading.

36. Microbarograph and rain gage. Each instrument used for monitoring the meteorological conditions at the FRF was read and inspected daily. For the microbarograph and rain gage with analog chart recording capabilities, (a) the pen was zeroed (where applicable); (b) the chart time was checked and corrected, if necessary; (c) a daily reading was marked on the chart for

reference; (d) the starting and ending chart times were recorded, as necessary; and (e) new charts were installed when needed.

Analysis

37. Air temperature. Mean air temperature was computed four times per day from 20-min digital data samples. From these data, monthly and annual means were determined.

38. Monthly and annual mean and extreme highest and lowest daily temperatures were determined from the daily maximum and minimum thermometer values.

39. Atmospheric pressure. Mean atmospheric pressure was computed four times per day from 20-min digital data samples. From these data, monthly and annual means were determined.

40. Wind speed and direction. Mean wind speed and direction were computed four times per day from 20-min digital data samples.

41. Annual, seasonal, and monthly joint probability distributions of wind speed versus direction were computed. Wind speeds were resolved into 3-m/sec intervals while the directions were at 22.5-deg intervals; i.e., 16-point-compass-direction specifications. These distributions are presented as wind "roses," such that the length of the petal represents the frequency of occurrence of wind blowing from the specified direction and the width of the petal is indicative of the speed in 3-m/sec intervals. Resultant directions and speeds were also determined by vector-averaging the data.

Wave Data

42. Thompson (1977) and Harris (1974) describe the procedure used for analyzing and summarizing the digital wave data contained in this report. The procedure is based on a Fast Fourier Transform (FFT) spectral analysis of 4,096 data values (1,024 sec sampled at 4 Hz) for each file processed.

43. The program computes the first five moments of the distribution of sea-surface elevations, then edits the digital data file by checking for "jumps" and "spikes" and for data points out of the 0- to 5-V range. A jump is defined as a data value greater than 2.5 standard deviations from the previous data value, while a spike is a data value 5 standard deviations or more from the mean. If less than 5 jumps or spikes in a row are found, the program linearly interpolates between acceptable data values and replaces the

erroneous data values. If more than 5 jumps or spikes in a row or a total of 100 bad data points for the file are found, the program stops interpolating and any further editing. At this point, the program analyzes the data and prints a flag indicating there is a problem with the file. If the variance is less than 0.001 m^2, the record is not analyzed. After editing, the first five moments of the distribution of sea-surface elevations are again computed. A cosine bell data window is applied to increase the resolution for the energy spectrum of the file; use of the data window is discussed by Harris (1974). After application of the data window, the program computes the variance spectrum (proportional to energy spectrum) using the FFT procedure. After the data files are analyzed, the results are eliminated for files that were flagged as bad or appear inconsistent with simultaneous observations from nearby gage sites. Frequently, the spectrum and/or distribution function of sea-surface elevations are examined to determine if the data are acceptable. After the analysis results are edited, monthly summaries of wave heights and periods are generated.

44. Unless otherwise specified, "wave height" in this report refers to the energy-based parameter H_{m_o} (defined as four times the standard deviation of the sea-surface elevations).

45. The wave period T_p is defined as the period associated with the maximum energy in the spectrum. This is resolved by partitioning the spectrum into frequency bands of equal width and determining the band with the maximum energy density. The period reported is the reciprocal of the center frequency (e.g., T_p = 1/frequency) of the spectral band. Since the spectral bands are of equal frequency width, namely 0.010742 Hz (e.g., 11/1,024 sec), the analysis provides uniform resolution in frequency. However, the resolution in period is not uniform since the period intervals become larger for lower frequencies. Because of the convention of reporting the period at the center of the interval in combination with the varying width of the period intervals, only a discrete set of period values was possible (Table 1). The wave periods used in this report have been rounded to the nearest second before summarization. Complete information about the energy contained in all frequency bands can best be obtained by inspecting the full spectrum, examples of which are included in Appendix B for gage 625 during storm wave conditions.

Table 1

Spectral Band and Peak Period Specifications

Band Number	Upper Limit of Frequency Band, Hz	Corresponding Period, Lower Limit of Band sec	Period Associated with Center Frequency of Band sec	Periods Not Reported sec
6	0.064	15.52	17	15, 16
7	0.075	13.30	14	13
8	0.086	11.64	12	
9	0.097	10.34	11	
10	0.107	9.31	10	
11	0.118	8.46	9	
12	0.129	7.76	8	
13	0.140	7.16	7	
14	0.150	6.65	7	
15	0.161	6.21	6	
16	0.172	5.82	6	
17	0.183	5.48	6	
18	0.193	5.17	5	
19	0.204	4.90	5	
etc				

Water Level Data

Collection

46. The water level information was obtained from a NOS tide gage which produced a digital paper tape of instantaneous water levels sampled continuously at 6-min intervals. At the end of each month, the paper tape was removed from the recorder and mailed to NOS in Rockville, Md., for analysis.

Analysis

47. The digital paper tape records of tide heights taken every 6 min were analyzed by the Tide Analysis Branch of NOS. An interpreter created a digital magnetic computer tape from the punch paper tape, which was then processed on a large computer. First, a listing of the instantaneous tidal height values was created for visual inspection. If errors were encountered, a computer program was used to fill in or recreate bad or missing data using correct values from the nearest NOS tide station and accounting for known time lags and elevation anomalies. The data were plotted and a new listing was

generated and rechecked. When the validity of the data had been confirmed, monthly tabulations of daily highs and lows, hourly heights (instantaneous height selected on the hour), and various extreme and/or mean water level statistics were computed. The monthly or annual mean sea level (msl) reported is the average of the hourly heights, while the mean tide level is midway between mean high water and mean low water which are the averages of the daily high and low water levels, respectively.

Visual Observations

48. Daily visual observations were made near 0700 hr to supplement instrumented data collection. These included observations of surface current speed and direction at (a) the seaward end of the pier, (b) the midsurf position on the pier, and (c) the beach 500 m updrift of the pier. Surface currents were determined by observing the movement of dye on the water surface.

49. Also measured were wave approach angles at the seaward end of the pier, breaker angle, and breaker type nearshore. Wave direction was also determined using a Raytheon Mariner's Pathfinder radar, manufactured by the Raytheon Marine Company, Manchester, N. H., mounted on the roof of the FRF building; use of this system for measuring ocean waves is explained by Mattie and Harris (1978).

Bathymetric and Pier Surveys

Collection

50. Profiles were obtained monthly and after storms by using the Coastal Research Amphibious Buggy (CRAB), a 10.7-m-tall amphibious tripod, and a Zeiss Elta-2 total station surveying system described by Birkemeier and Mason (1984). Each profile extended seaward from the baseline behind the dune to a water depth of about 10 m, within 0.6 km north and south of the FRF pier. Their locations are shown in Figure C1. The survey accuracy was about ±3 cm horizontally and vertically. Monthly soundings along both sides of the FRF pier were also collected by lowering a weighted measuring tape to the bottom and recording the distance below the pier deck. Soundings were taken midway between the pier pilings to minimize errors caused by scour near the pilings.

Analysis

51. The pier, beach, nearshore, and offshore data were reduced to position (X, Y) and depth (Z) triplets relative to established monumentation and NGVD, respectively. The data were listed, and a display of the profiles (i.e. distance along the range versus elevation) was generated for visual inspection. After the data were edited, another set of routines was used to compute contour diagrams of the bottom topography and time sequences of bottom elevations at selected locations along the pier.

Photographic Data

Aerial

52. Aerial photography was taken quarterly by using a 9-in.-negative format mapping aerial camera capable of producing black/white and color photography at a scale of 1:12,000. All coverage was at least 60 percent overlap, with flights flown as close as possible to low tide between 1000 and 1400 hr with less than 10 percent cloud cover.

53. The photographs obtained on 1 February, 11 April, and 3 October included flight lines 2 and 3 (Figure 3), while those obtained on 7 September also included coverage from Cape Henry, Va., to Cape Hatteras, N. C. (flight line 1).

Beach

54. Daily color slides of the beach were taken using a 35mm camera from the same location on the pier looking north and south. The location from which each picture was taken as well as the date, time, and a brief description of the picture were marked on the slides. An inventory was also maintained.

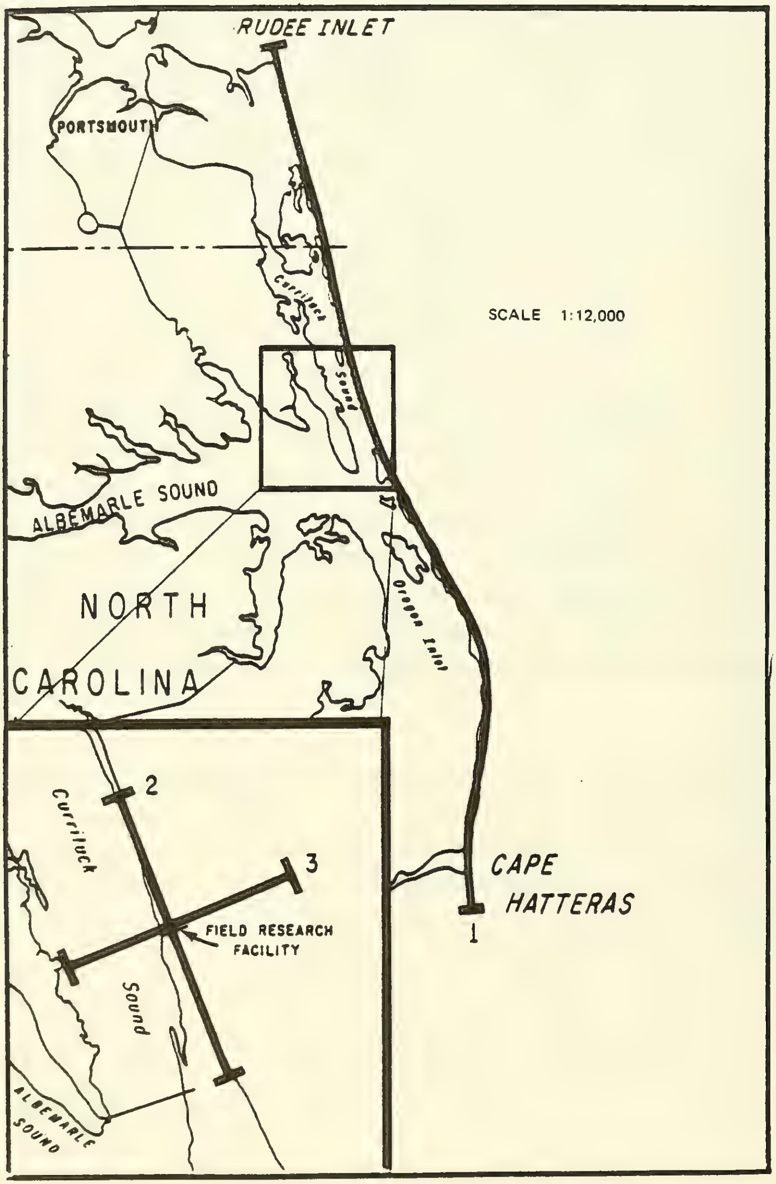


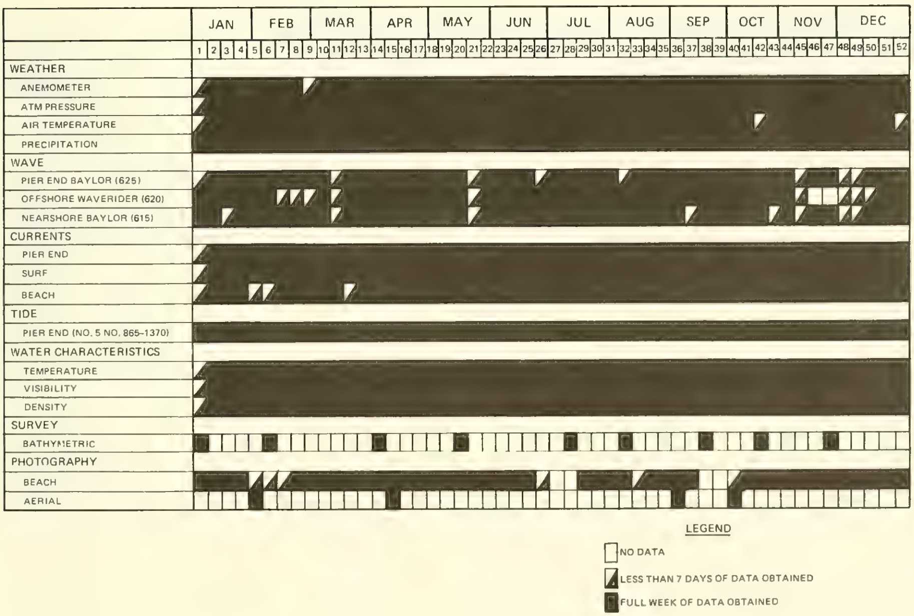
Figure 3. Quarterly aerial photography flight lines, 1984

PART V: DATA AVAILABILITY AND RESULTS

55. Table 2 is intended as a quick reference guide to show the dates for which various types of data are available. Wave gage histories which may explain major gaps in the data are provided in Appendix B. This part provides results of the weather, wave, surface current, tidal, water characteristics, survey, and photographic measurements made during the year. Although this report is intended to provide basic data for analysis by users, many of the daily observations have been summarized by month, season, or year to aid in interpretation. Daily observations have been reported in the 1984 series of monthly Preliminary Data Summaries. If individual data are needed, the user can obtain the detailed information by following the procedures described in Part I (paragraphs 6 and 7).

Table 2

1984 Data Availability



Meteorology

56. This section summarizes the meteorological measurements made at the FRF in 1984. A discussion of the data and a comparison with previous years are also presented. Appendix D contains atmospheric pressure, wind speed and wind direction values during storm conditions.

Air temperature

57. The annual mean temperature for 1984 (based on four observations per day) was 15.4° C with a 3.7° C standard deviation. Monthly mean temperatures are shown in Table 3 and Figure 4. The marine climate at the FRF moderates the extremes of both summer and winter. Summer temperatures were relatively consistent with monthly averages near 25° C and low standard deviations. During December through February, although infrequent, freezing temperatures can be expected at the FRF. Large daily air temperature variations were observed in the spring and fall caused primarily by the effect of onshore/offshore winds and the temperature difference between the ocean and land.

58. A very cold January (see Figure 4) was a major reason the annual average air temperature was 0.7° C lower than in 1983.

Table 3

Monthly Mean Air Temperature and Atmospheric Pressure Statistics

	Air Temperature			Atmospheric Pressure		
Month	1984	1983	1983 and 1984	1984	1983	1983 and 1984
Jan	3.3	9.3	6.2	1020.8	1017.6	1019.2
Feb	7.2	6.9	7.1	1015.9	1015.5	1015.7
Mar	7.2	10.5	8.9	1014.2	1010.0	1012.1
Apr	12.7	13.3	13.1	1012.8	1013.1	1012.9
May	19.1	18.9	19.0	1015.8	1016.9	1016.4
Jun	23.6	23.2	23.4	1016.2	1016.5	1016.3
Jul	25.3	26.8	26.1	1017.0	1016.8	1016.9
Aug	25.4	25.8	25.6	1015.2	1016.7	1016.0
Sep	21.3	19.4	20.3	1018.6	1018.3	1018.4
Oct	18.2	17.7	17.9	1020.4	1020.4	1020.4
Nov	11.2	12.6	11.9	1020.4	1015.4	1017.9
Dec	10.6	8.2	9.4	1021.1	1020.4	1020.8
Annual	15.4	16.1	15.7	1017.4	1016.5	1016.9

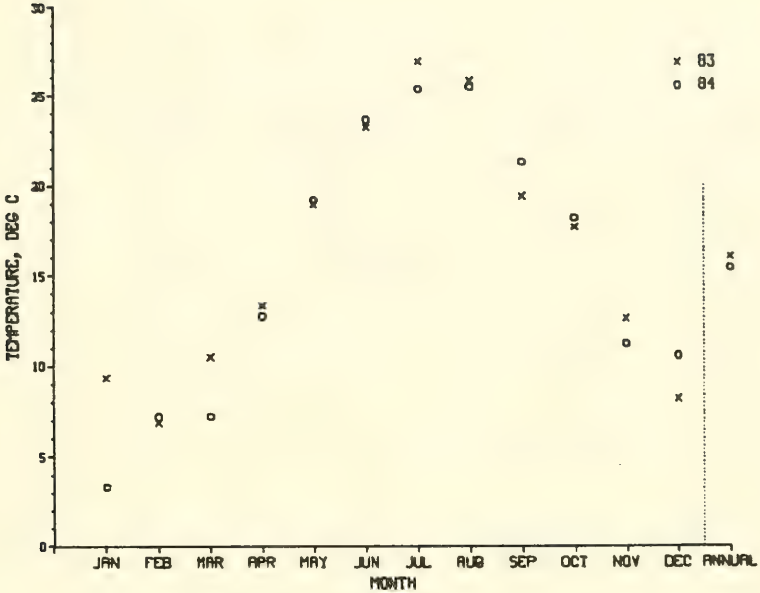


Figure 4. 1984 mean monthly air temperatures

Atmospheric pressure

59. The mean annual atmospheric pressure for 1984 was 1017.4 mb with an associated 6.2-mb standard deviation. There was a tendency for low pressures to develop during March and April and high pressures to form in January and then again during September through December (Figure 5 and Table 3).

60. In comparison with the only prior year of measurements, taken every 6 hr, the annual mean was 0.9 mb above that for 1983.

Precipitation

61. Precipitation was low during 1984 with June and October-December having the lowest monthly totals (under 30 mm) measured since 1978 (Figure 6 and Table 4). A total of 938 mm was received during the year for a monthly mean of 78 mm.

62. In prior years, the monthly mean was 91 mm (14 percent higher than during 1984). As seen in Figure 6, climatology shows a relatively even distribution of precipitation; however, 1984 had a wet summer (177 mm in August) and a dry fall.

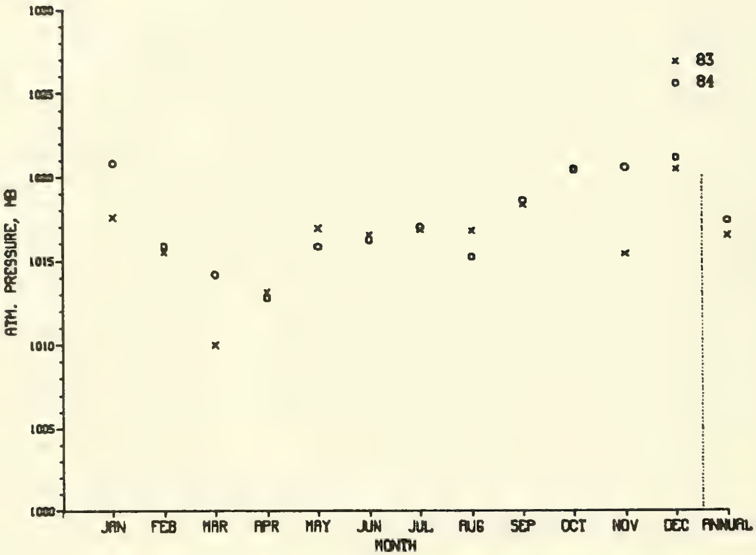


Figure 5. Mean monthly atmospheric pressure

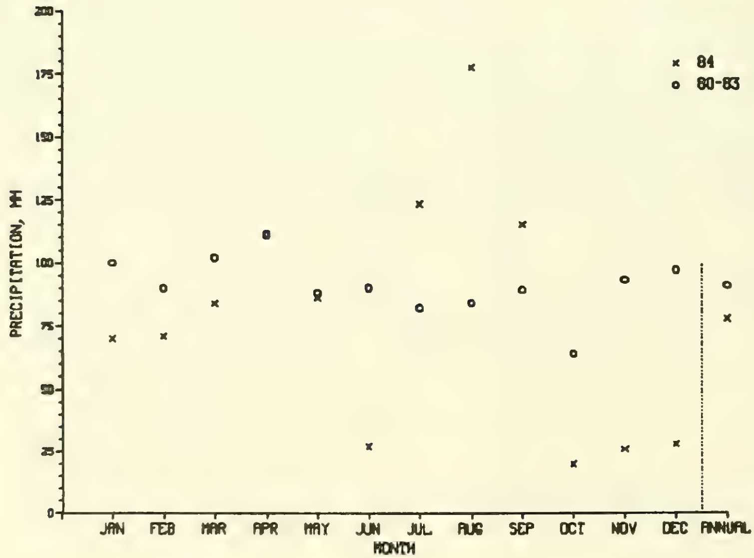


Figure 6. Mean monthly precipitation

Table 4

Precipitation Statistics

Month	Total 1984, mm	Mean 1978-1983, mm	1978-1984 Extremes Maxima, mm	Minima, mm
Jan	70	100	180	45
Feb	71	90	127	46
Mar	84	102	168	48
Apr	111	111	182	46
May	86	88	239	39
Jun	27	90	130	27 (1984)
Jul	123	82	200	19
Aug	177	84	220	36
Sep	115	89	160	5
Oct	20	64	108	20 (1984)
Nov	26	93	130	26 (1984)
Dec	28	97	131	28 (1984)
Annual	938	1,090		
Monthly avg.	78	91		

Winds

63. Since local winds frequently control nearshore currents and wave conditions, an understanding of the wind and wave climate at any coastal location is important to most studies of hydrodynamic and sedimentary processes.

64. Present year. The distribution of winds during 1984 is shown in Figure 7. Winds blew from north through northeast directions 27.2 percent of the time and from south-southwest through west-southwest 27.6 percent, and all the other directions 3 to 6 percent each during the year. The resultant wind speed and direction was 0.9 m/sec from 19 deg west of true north (Table 5). Wind speeds exceeded 10 m/sec 8 percent of the time (over 700 hr); during more than 6 out of every 10 of these times the winds blew from north-northeast.

65. Wind distributions changed with the season (Figure 8) such that during January through March, 32.5 percent blew from north through northeast and 9 percent blew from the west. During this season, the wind speed exceeded 10 m/sec over 11 percent of the time. The resultant magnitude and direction was 1.7 m/sec and 347 deg, respectively.

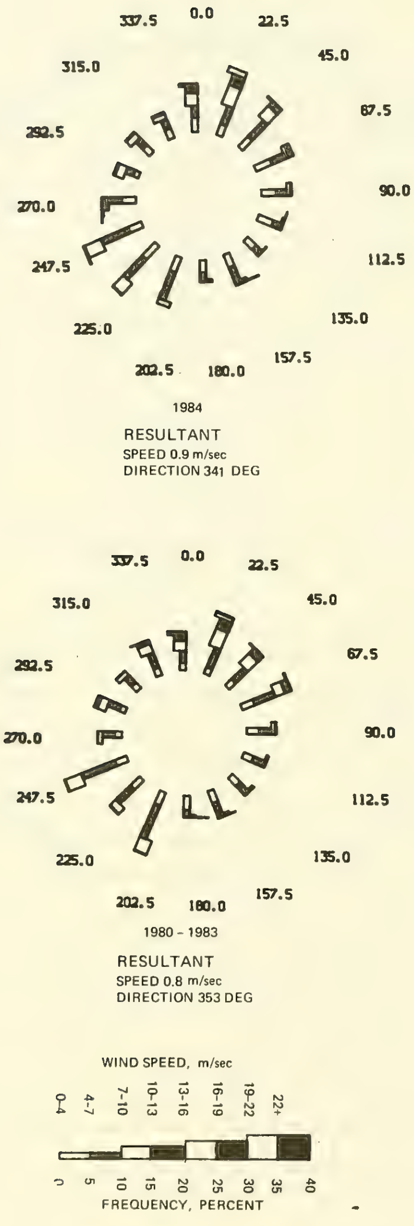


Figure 7. Comparison of annual wind roses, 1984 versus 1980-1983

Table 5

Resultant Wind Speed and Directions Relative to True North

Month	1984 Speed m/sec	1984 Direction deg	1980-1983 Speed m/sec	1980-1983 Direction deg	1980-1984 Speed m/sec	1980-1984 Direction deg
			Annual			
Jan-Dec	0.9	341	0.8	353	0.8	350
			Seasonal			
Jan-Mar	1.7	347	2.0	352	1.9	351
Apr-Jun	1.1	233	0.9	195	0.9	205
Jul-Sep	0.7	29	0.1	172	0.1	79
Oct-Dec	1.7	353	2.0	3	1.9	1
			Monthly			
Jan	3.6	2	2.3	344	2.5	349
Feb	1.0	255	2.3	2	1.7	354
Mar	1.5	348	1.5	350	1.5	349
Apr	0.1	245	1.1	219	0.9	219
May	1.5	244	0.8	189	0.9	207
Jun	1.8	223	0.8	171	0.9	190
Jul	2.3	228	1.6	212	1.8	217
Aug	0.7	41	0.2	4	0.3	21
Sep	4.0	39	1.2	50	1.8	45
Oct	1.9	19	2.2	34	2.1	31
Nov	2.6	351	1.8	340	2.0	343
Dec	1.1	309	2.4	349	2.1	345

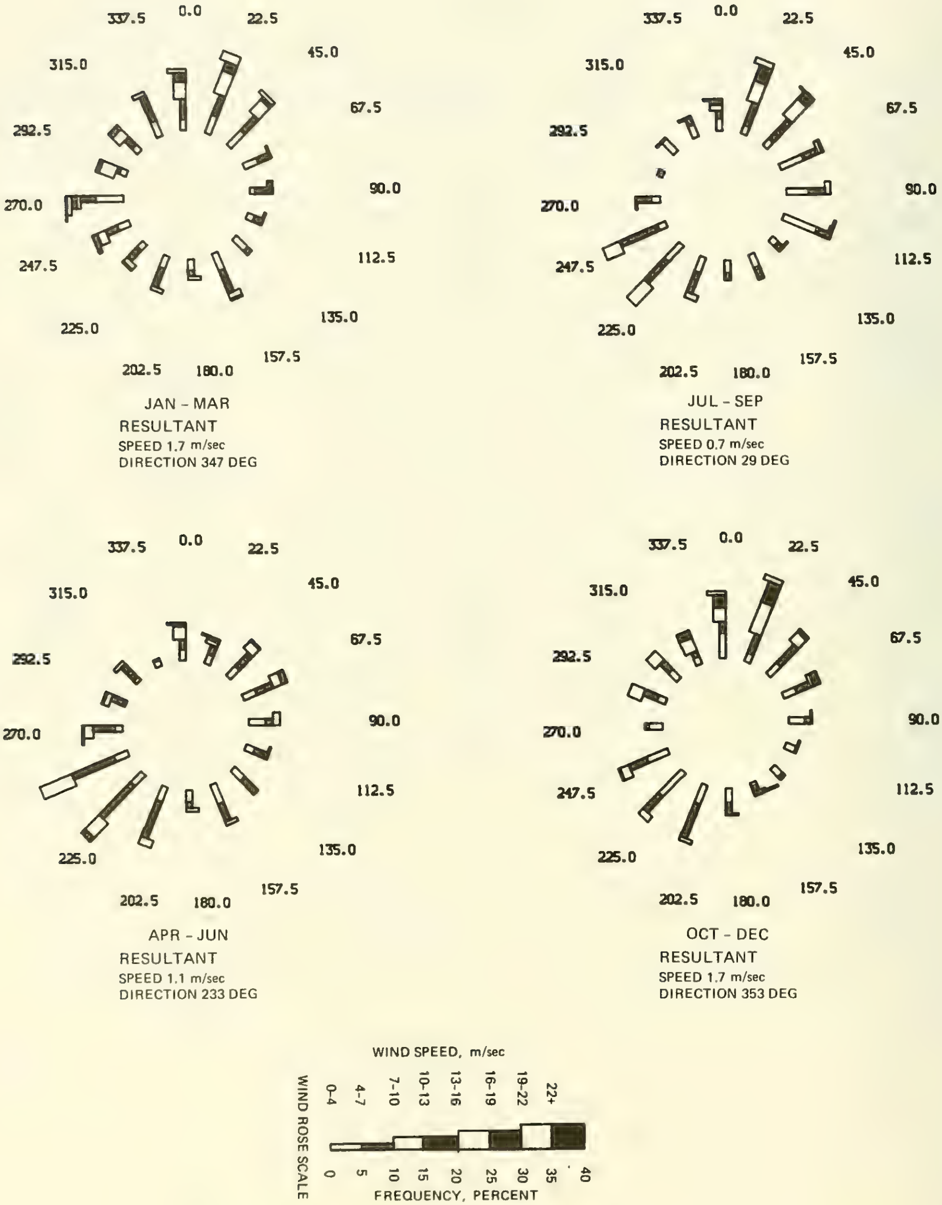


Figure 8. Seasonal wind roses, 1984

66. During April through June, the winds were low, exceeding 10 m/sec only 3.4 percent of the time. Just under 38 percent of the winds were directed from south-southwest through west-southwest. The resultant speed during this season was 1.1 m/sec, and the direction was 233 deg.

67. The winds during July through September were bidirectional, with 22.7 percent of the winds blowing from north-northeast through northeast and 22.7 percent from southwest through west-southwest. The resultant speed was 0.7 m/sec, while the resultant direction was 29 deg, indicating that north-easterly winds occurred more often. For 6.8 percent of the winds, the speed exceeded 10 m/sec.

68. The winds were also mixed during October through December, with 32.6 percent blowing from north through northeast and 27.3 percent from south-southwest through west-southwest. Wind speeds exceeded 10 m/sec 10.4 percent of the time.

69. Present versus past years. The winds for 1984 were near climatology. Climatology as used here refers to the accumulation of information from prior years. There was a slight tendency for fewer north-northwest and east-northeast winds with a correspondingly greater tendency for winds from southwest and west. Wind speeds exceeded 10 m/sec 2 percent (175 hr) more often than climatology. The tendency was for winds during 1984 to exceed 10 m/sec more often during January through March and less often during October through December. January through March winds were near climatology. During April through June there were more westerly winds, while during July through September the winds were more easterly. During October through December, there were more winds from southwest and less from north-northwest and northwest.

70. Combination of all years. Annual and seasonal distributions of winds for the combined years 1980 through 1984 are presented in Figure 9. Of the 6,672 observations, over 9.5 percent exceeded 10 m/sec. For those speeds in excess of 10 m/sec, 40 percent occurred during October through December and 34 percent during January through March. During January through March the winds are most often from north-northwest through east-northeast with few from east through south. April through June, the winds are predominantly west-southwest through south-southwest with some northeast; July through September winds are bimodal in the northeast and southwest quadrants. The October through December period has very few east through south winds; however, the winds are distributed over all other directions.

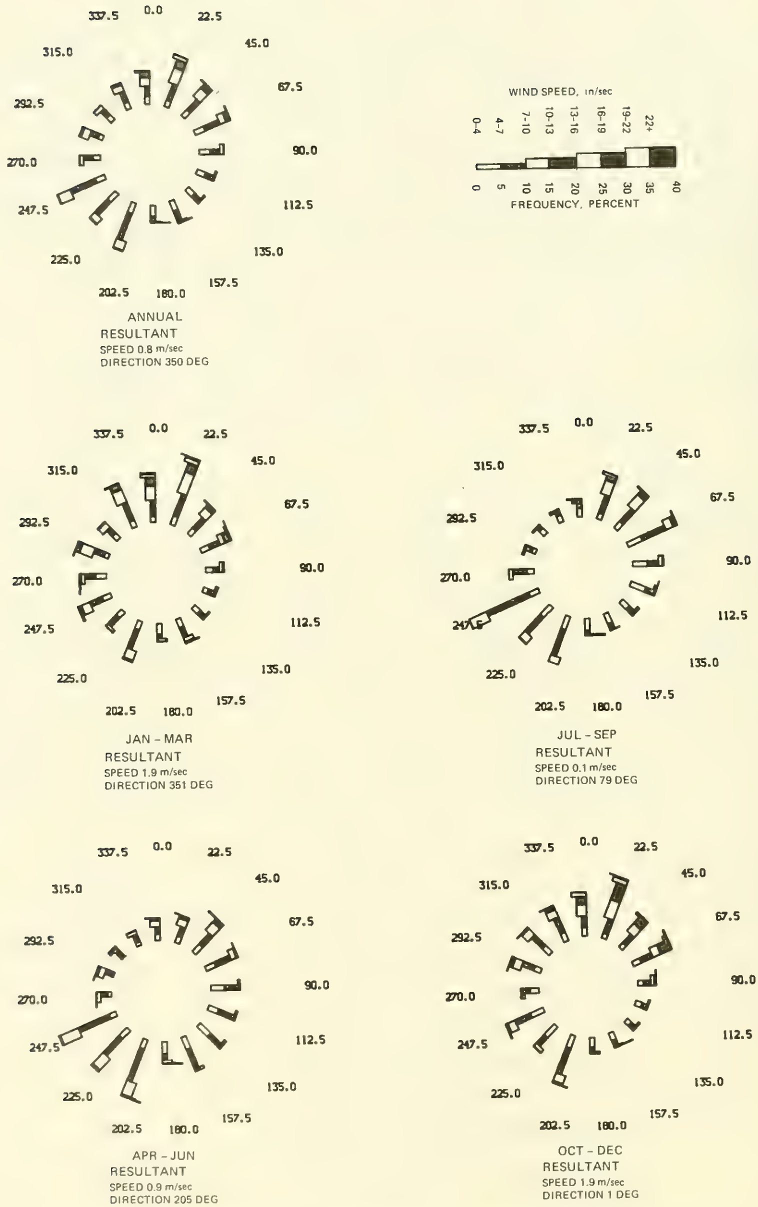


Figure 9. Annual and seasonal wind roses, 1980-1984

Waves

71. This section presents summaries of the wave data. A review of the wave conditions during 1984 and a comparison to previous years are followed by a discussion of the wave climate for 1980 through 1984. Appendix B contains summaries for each gage which include height and period distributions, wave direction distributions, persistence tables and wave spectra for gage 625 during storm conditions. A discussion of individual major storms is given in Part VI, and Appendix D contains hourly wave data for times when the heights H_{m_o} exceeded 2 m at the seaward end of the FRF pier.

Present data year

72. Spatial variation. The distribution of wave heights for all three gages operated during the year is shown in Figure 10. For a given frequency of occurrence, wave heights were highest at the gage located 3 km from shore (gage 620), second at the pier end (gage 625), and lowest at the landward end of the pier (gage 615). This pattern of variation (decrease of wave height with depth) is consistent with previous years' data. Refraction, bottom friction, and wave breaking contribute to the observed differences in height. Wave height statistics for the staff gage (615) located at the landward end of the pier in shallow water were considerably different than the other gages. In all but the very calmest conditions, this gage is within the breaker zone. Consequently, these statistics represent a lower energy wave climate in which the annual mean height is more than 20 percent less than at the seaward end of the pier.

73. The distributions of wave periods for all of the gages are shown in Figure 11. Although the distributions of wave periods for gages 625 and 620 were similar, there was a tendency for gage 625 to have higher frequencies of wave periods longer than 9 sec and fewer wave periods shorter than 9 sec. Gage 615 had a higher occurrence of wave periods 6 sec and less, primarily caused by waves that frequently break seaward of the gage. This pattern of variation between gages is consistent with data from the previous years.

74. Temporal variation. Temporal height and period trends for gage 625 and 620 are shown in Figures 12 and 13, respectively, and are consistent with those for gage 615. Seasonal wave height distribution variations as shown for

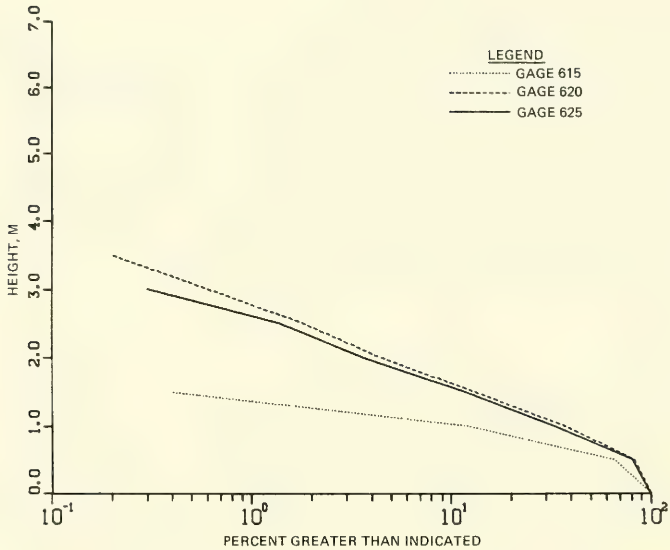


Figure 10. Annual wave height distributions, 1984

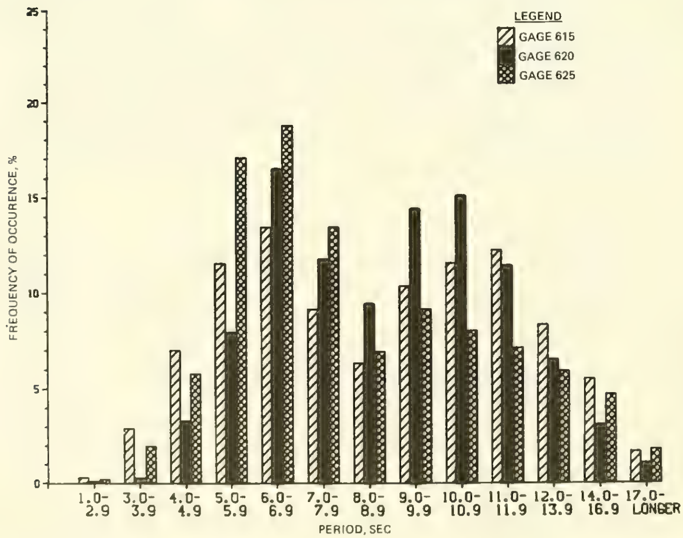
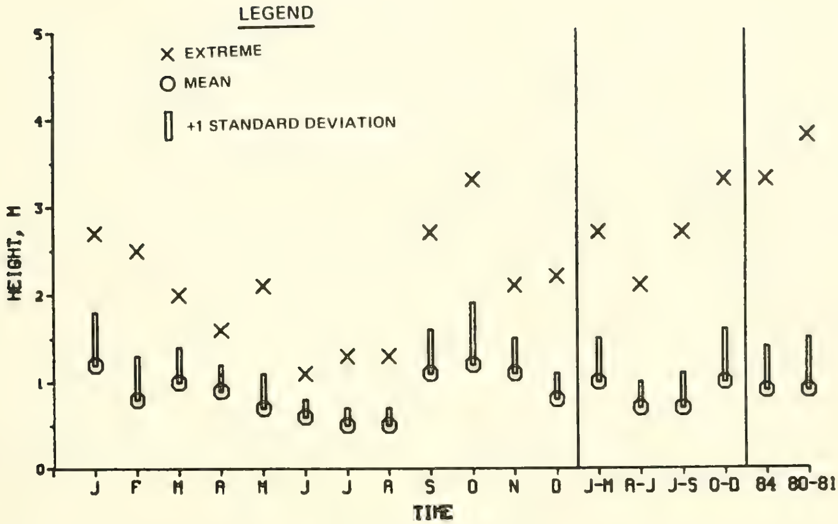
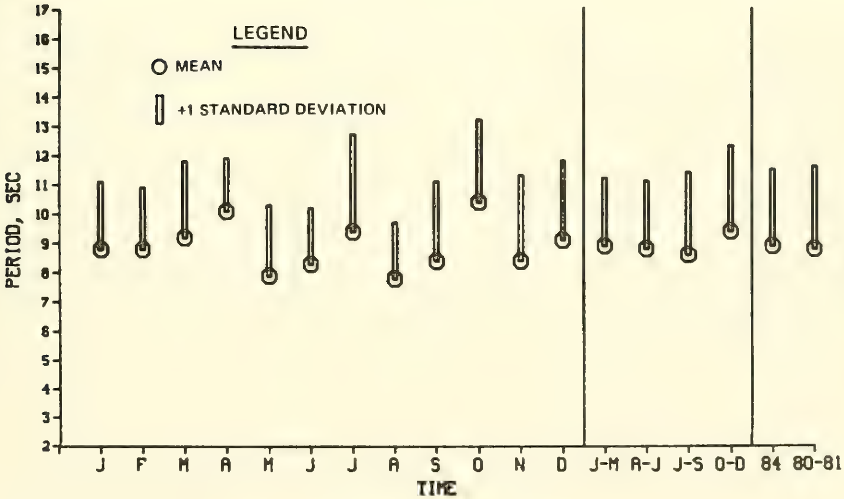


Figure 11. Annual wave period distributions, 1984

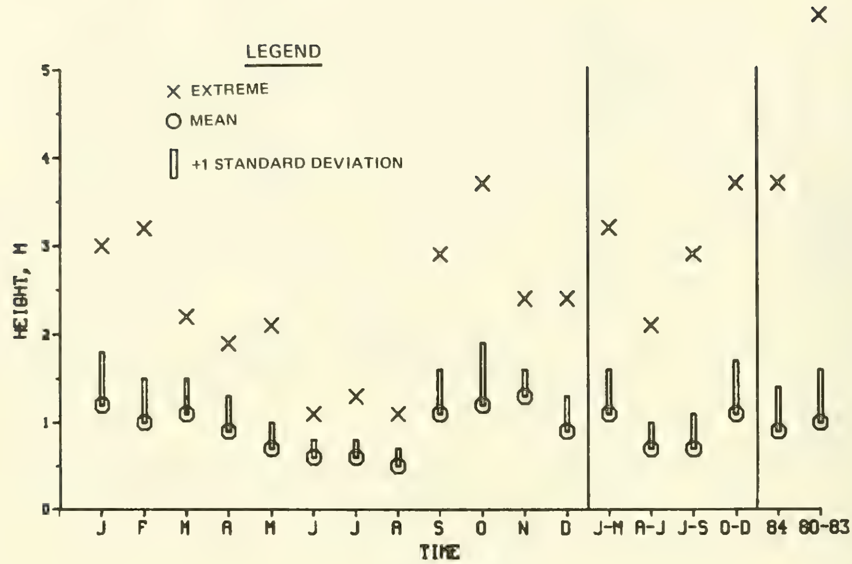


a. Wave height

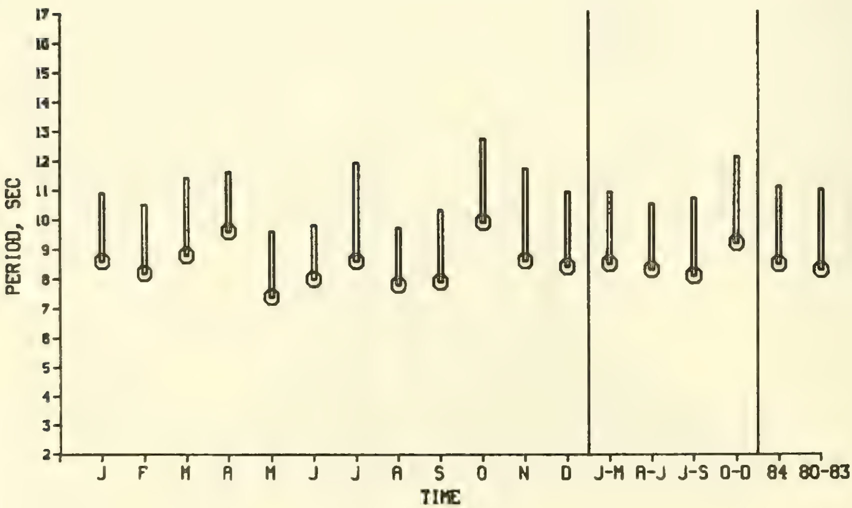


b. Wave period

Figure 12. Wave statistics for gage 625, 1984



a. Wave height



b. Wave period

Figure 13. Wave statistics for gage 620, 1984

gage 625 in Figure 14 were similar for all gages; waves were most severe during fall and winter. Seasonal wave period distributions (Figure 15) were also similar for all gages. In general, the tendency was for a high proportion of wave periods at 10 and 11 sec during January through June; 8- and 9-sec periods during July through September; and 10 sec or longer from October through December.

75. The distribution of wave directions for the year, based on visual observations (Figure 16), revealed that waves approached the north side of the pier 35 percent of the time, from the south 61 percent, and approximately shore-normal 4 percent. However, when wave heights exceeded 2 m at the seaward end of the pier, the waves approached three out of every four times from the north side and the other times the waves approached from near shore-normal.

76. Seasonal variation of wave direction is shown in Figure 17. Wave directions were bimodal during January through March, approaching from north and south of the pier almost equally. The waves were predominantly from the south side during the rest of the year despite frequent northerly waves during August and September and shore-normal waves in September and October (Table 6).

Present versus past years

77. Based on the data from gage 625, the wave conditions during 1984 were mild in comparison with prior years (Figure 18). The frequency of wave heights above the annual mean was the lowest of any year since 1980. In particular, February and March were much less severe than prior years (Figure 19). Wave periods were generally longer throughout the year (Figure 20), with higher occurrences of 10- and 11-sec periods measured.

78. The wave directions for the year were from south of the pier 9 percent more often than during prior years (Figure 16). The resultant wave height and angle were 0.8 m and 73.6 deg, respectively, while for 1980 through 1983 the wave height and angle were 0.8 m and 66.5 deg (the pier is aligned at 70 deg). However, during storms (H_{m_o} > 2 m) all of the wave approach angles were from the north or shore-normal.

All years combined

79. The 5 years of data from 1980 through 1984 provide the most complete description of the wave climate at the FRF. The annual and seasonal height distributions for the gage at the seaward end of the research pier are presented in Figure 21. Ten percent of the wave heights exceed 1.8 m and

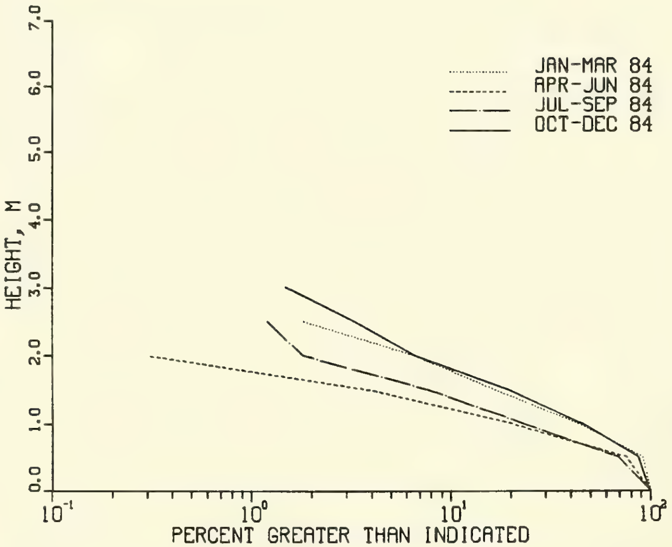


Figure 14. Seasonal wave height distributions for gage 625, 1984

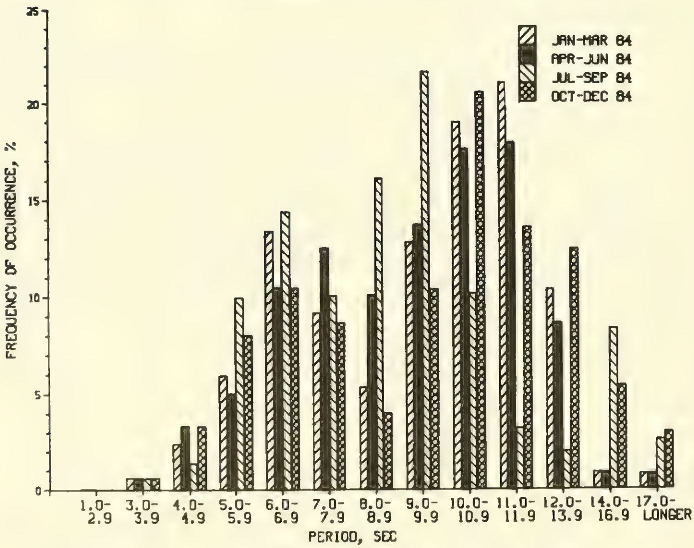


Figure 15. Seasonal wave period distributions for gage 625, 1984

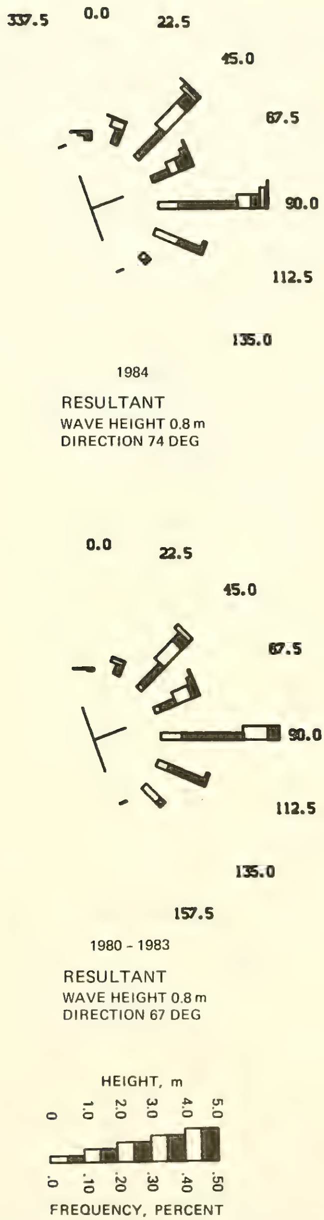


Figure 16. Comparison of annual visual wave observation roses, 1984 versus 1980-1983

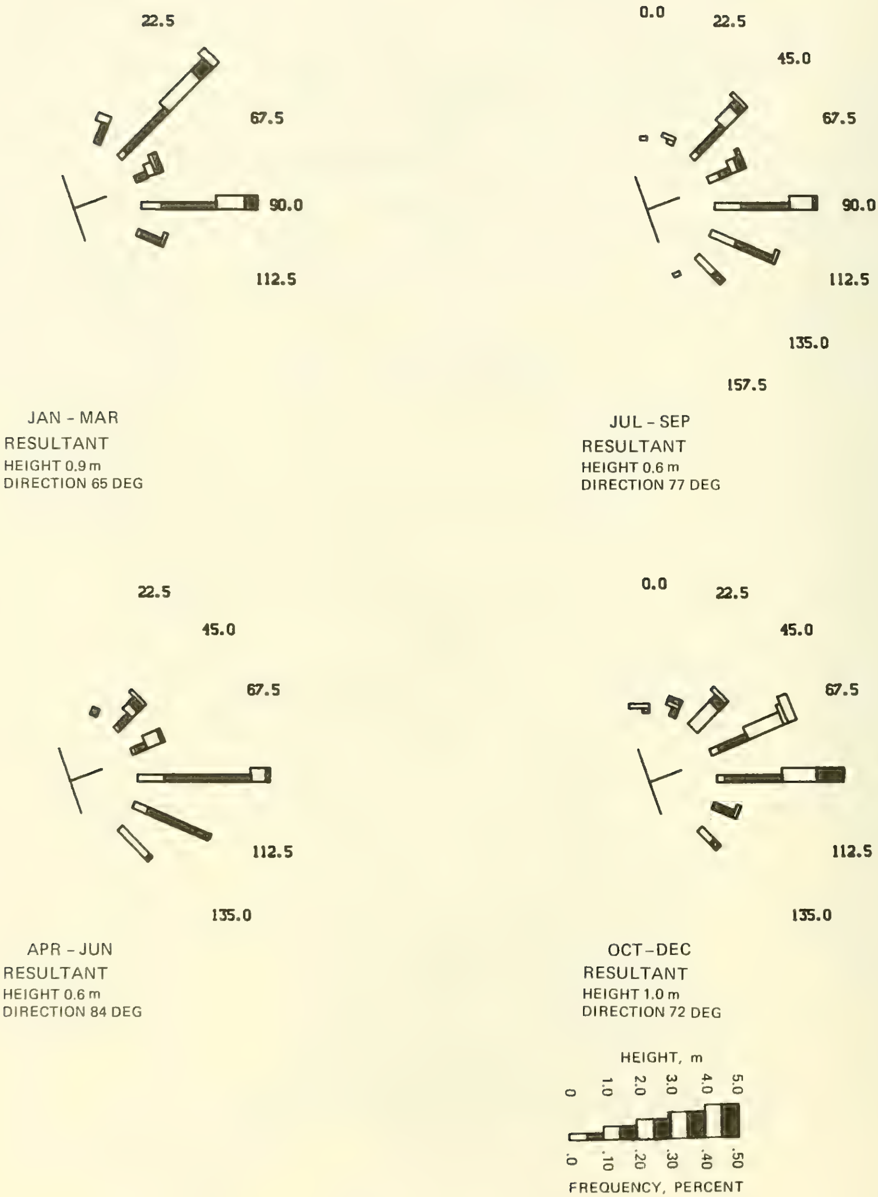


Figure 17. Seasonal visual wave observation roses, 1984

Table 6

Resultant Wave Height and Directions

Month	1984		1980-1983		1980-1984	
	Height, m	Direction deg True N	Height, m	Direction deg True N	Height, m	Direction deg True N
Annual						
Jan-Dec	0.8	74	0.8	67	0.8	68
Seasonal						
Jan-Mar	0.9	65	1.4	65	1.0	63
Apr-Jun	0.6	84	0.7	76	0.6	78
Jul-Sep	0.6	77	0.6	71	0.6	72
Oct-Dec	1.0	72	1.0	61	1.0	63
Monthly						
Jan	1.0	60	0.9	54	1.0	55
Feb	0.7	75	1.1	65	1.0	66
Mar	0.9	62	1.1	67	0.9	67
Apr	0.8	79	0.7	70	0.7	72
May	0.5	81	0.7	78	0.7	78
Jun	0.5	96	0.6	81	0.6	84
Jul	0.4	94	0.4	73	0.4	80
Aug	0.4	79	0.6	71	0.6	72
Sep	1.0	69	0.8	68	0.9	69
Oct	1.1	73	1.1	64	1.1	66
Nov	0.9	65	1.0	58	0.9	60
Dec	0.7	80	0.9	61	0.9	64

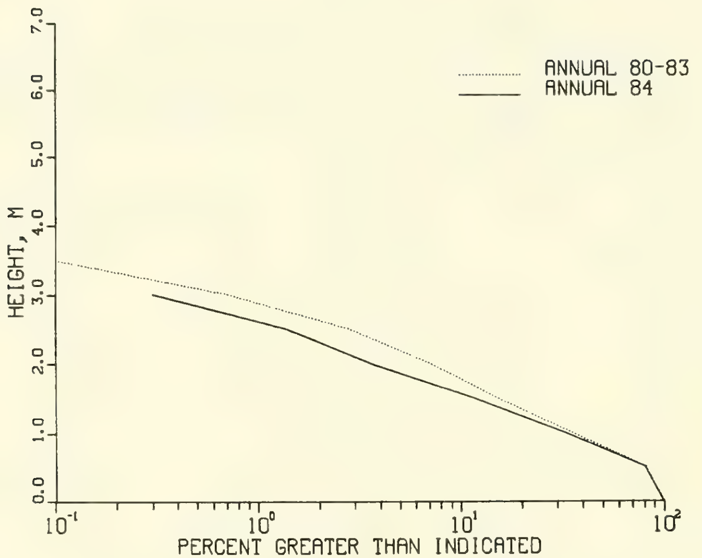


Figure 18. Comparison of annual wave height distributions for gage 625

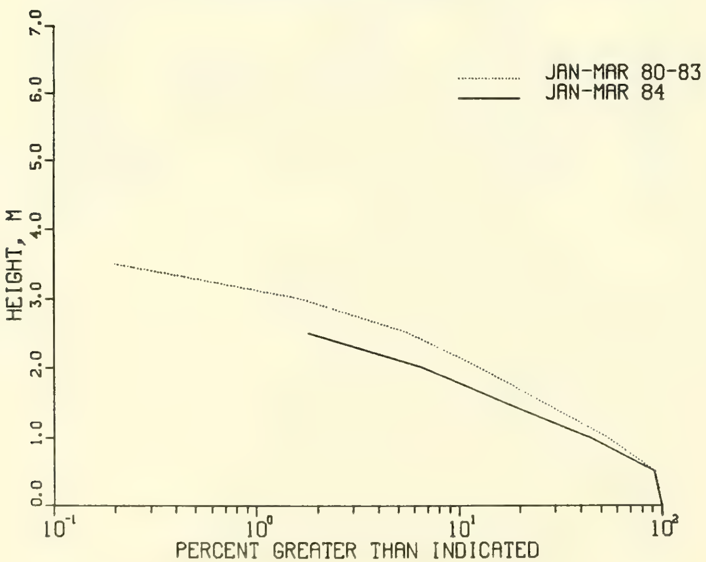


Figure 19. Comparison of January through March wave height distributions for gage 625

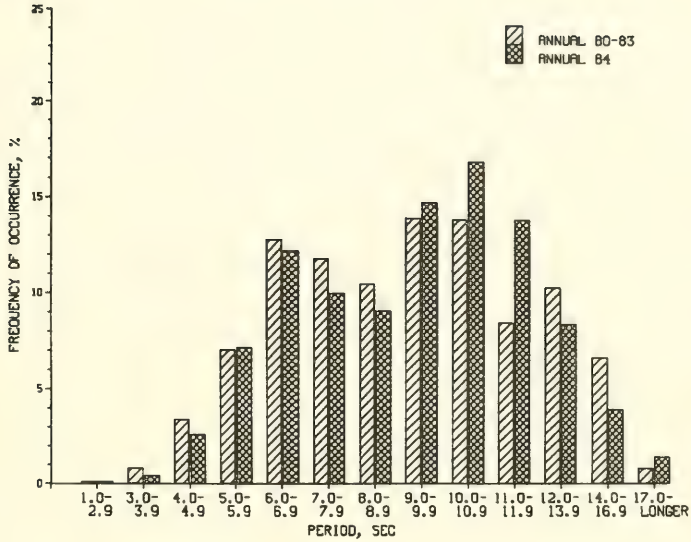


Figure 20. Comparison of annual wave period distributions for gage 625

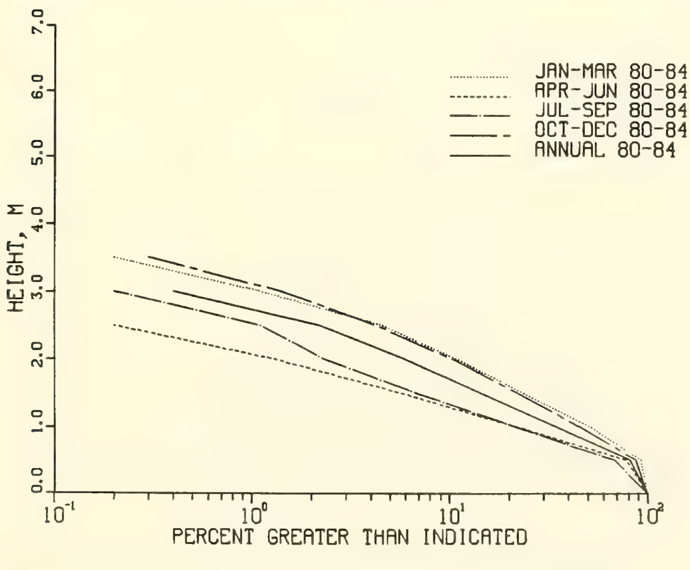


Figure 21. Wave height distributions, 1980-1984

1 percent exceed 2.8 m; at the offshore (3 km) Waverider, 10 and 1 percent correspond to 1.9 m and 3.0 m, respectively. The highest waves occur from October to March and the lowest waves occur from April to June.

80. The distribution of wave periods is presented in Figure 22. Periods of 9 and 10 sec have been measured approximately 14 percent each; 6- and 7-sec periods 12 to 13 percent each; while 8-, 11-, and 12-sec periods occur 10 percent each. Seasonal distribution of wave period is shown in Figure 23. During winter and fall wave periods 10 sec or longer tend to occur most often. The joint distribution of wave height versus period for gages 625 and 620 is shown in Table 7. Each distribution is based on over 6,022 observations. The values presented can be converted to percent by dividing by 10. Higher waves are generally associated with longer wave periods.

81. Annual and seasonal wave direction distributions for the combined years are shown in Figure 24. Although 42 percent of the waves approach from the north, 4 percent shore-normal, and 54 percent from south of the pier, the annual resultant direction is 67.9 deg, slightly north of the pier orientation. This is due to the relative influence the highest waves have on the computation of the resultant; for storm conditions, 59 percent approach from the north, 11 percent approach from shore-normal, and only 30 percent approach from the south.

Currents

82. In this section, the results of daily surface longshore current measurements are presented. Figure 25 shows the 1984 measurements at the beach, pier midsurf, and pier end locations. Since the relative influences of the winds and waves vary with position from shore, the current speeds and, to some extent, direction vary at the three current measurement locations. Magnitudes generally are the largest at the midsurf location and lowest at the end of the pier. However, annual mean currents (Table 8 and Figure 26) were directed southward at 5 cm/sec at the midsurf location, 4 cm/sec at the beach location, and 16 cm/sec at the seaward end of the pier. Despite frequent reversals, the mean monthly currents were generally directed southward during fall and winter and northward during May through August. This seasonality of currents was consistent with wind and wave patterns previously discussed.

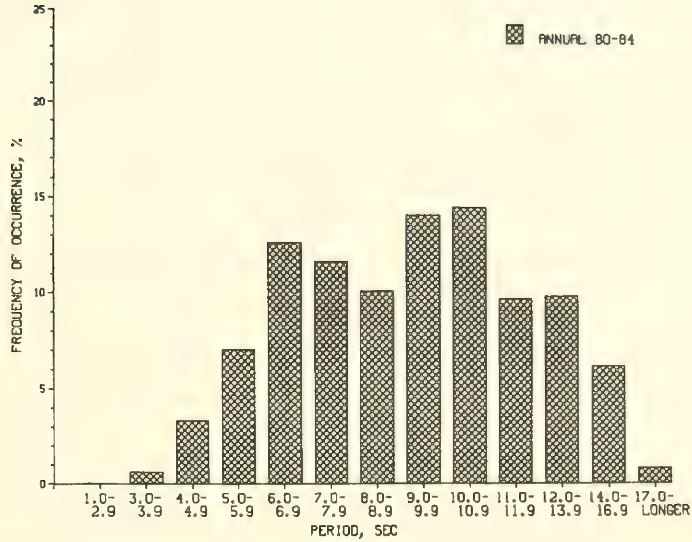


Figure 22. Wave period distribution, 1980-1984

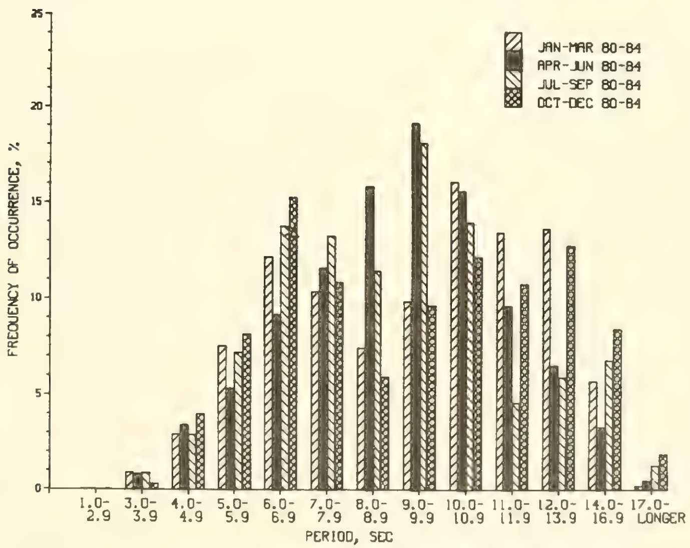


Figure 23. Seasonal wave period distributions for gage 625, 1980-1984

Table 7

Joint Distribution of Wave Height Versus Period, 1980-1984

Gage 625

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	1	2	4	9	17	24	36	29	13	20	18	2	177
.50 - .99	.	5	26	36	52	45	51	74	71	46	31	22	5	464
1.00 - 1.49	.	.	5	25	42	29	15	17	28	21	21	5	.	208
1.50 - 1.99	.	.	.	5	19	15	5	6	8	8	12	6	1	85
2.00 - 2.49	.	.	.	.	3	5	3	4	4	5	7	6	.	37
2.50 - 2.99	.	.	.	.	.	2	2	2	2	2	5	3	.	18
3.00 - 3.49	.	.	.	.	.	.	.	.	1	1	1	1	.	4
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	6	33	70	125	115	100	139	142	98	97	61	8	

Gage 620

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	1	1	2	5	8	12	24	32	19	7	15	10	1	137
.50 - .99	2	8	27	43	57	51	57	73	59	44	23	17	3	464
1.00 - 1.49	.	.	9	33	49	31	18	19	27	21	19	4	1	231
1.50 - 1.99	.	.	.	8	27	13	6	6	10	6	12	5	1	94
2.00 - 2.49	.	.	.	1	8	9	3	5	5	5	6	4	.	46
2.50 - 2.99	.	.	.	.	1	4	1	2	2	2	3	1	.	16
3.00 - 3.49	.	.	.	.	.	.	1	1	1	1	1	.	.	5
3.50 - 3.99	.	.	.	.	.	.	.	1	1	1	.	1	.	4
4.00 - 4.49	.	.	.	.	.	.	.	.	.	1	.	.	.	1
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	9	38	90	150	120	110	139	124	88	79	42	6	

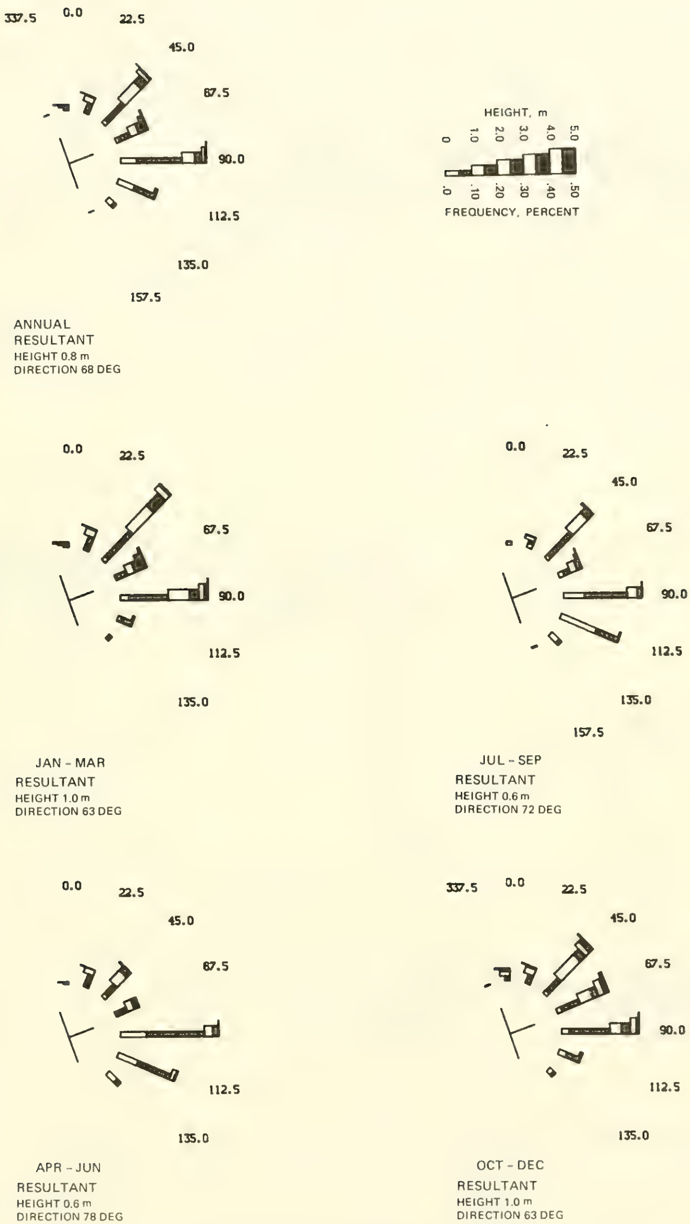
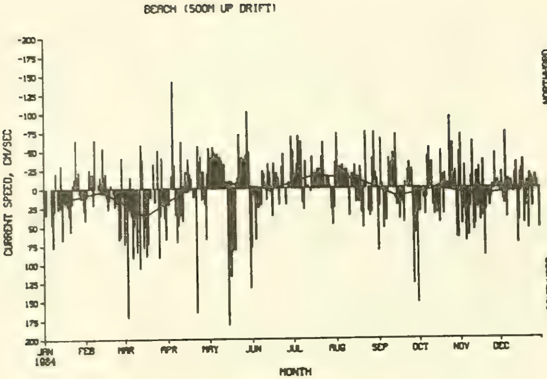
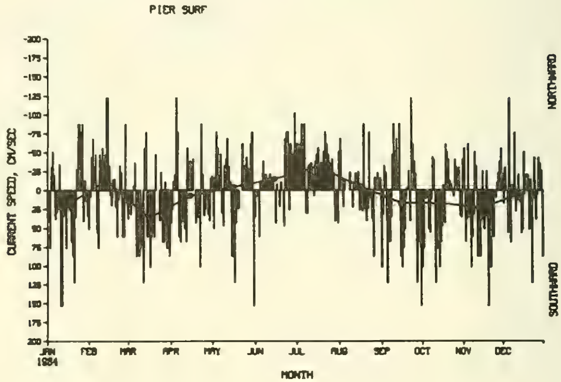


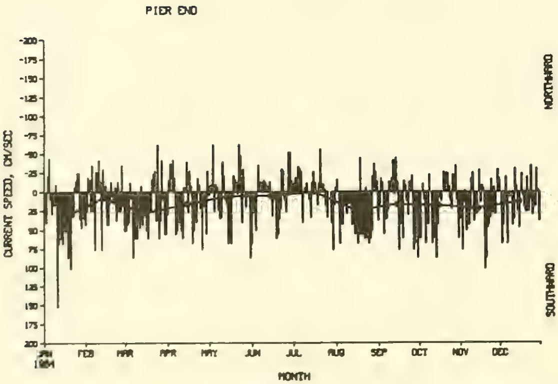
Figure 24. Annual and seasonal wave roses, 1980-1984



a. Beach (500 m updrift)



b. Pier surf



c. Pier end

Figure 25. Daily surface currents, 1984

Table 8

Annual and Monthly Longshore Surface Currents at the FRF*

Month	Beach, cm/sec 1984	Beach 1981–1983	Beach 1981–1984	Pier Midsurf, cm/sec 1984	Pier Midsurf 1980–1983	Pier Midsurf 1980–1984	Pier End, cm/sec 1984	Pier End 1980–1983	Pier End 1980–1984
Jan	15	17	17	19	22	21	33	20	23
Feb	3	12	10	−13	10	5	8	26	22
Mar	37	9	16	37	4	11	28	26	26
Apr	2	4	4	8	−5	−2	16	10	11
May	−6	−3	−4	−4	−12	−10	6	8	8
Jun	1	−10	−7	−14	−17	−16	5	6	6
Jul	−16	−16	−16	−31	−21	−23	0	4	3
Aug	−12	−9	−10	−5	−14	−12	25	7	11
Sep	12	−1	2	17	−4	0	17	13	14
Oct	1	6	5	18	10	12	18	12	13
Nov	10	13	12	24	11	14	23	12	14
Dec	3	10	8	3	19	16	13	11	11
Annual	4	3	3	5	0	1	16	12	13

* + = southward; − = northward.

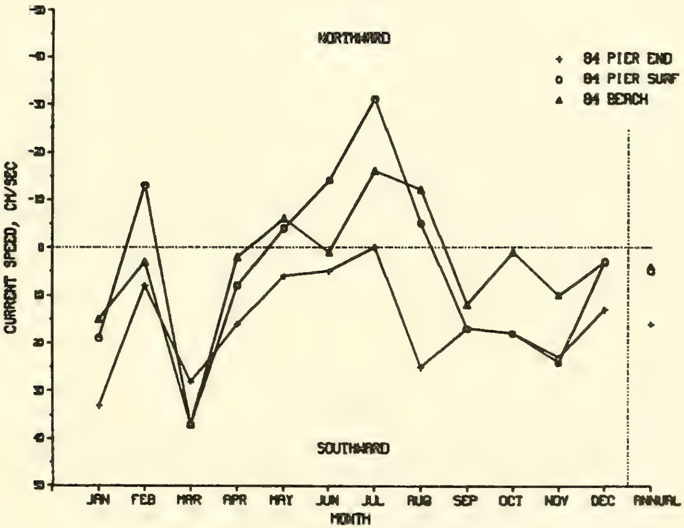


Figure 26. Monthly mean currents, 1984

1984 versus previous years

83. Mean midsurf position currents were consistent with prior years with the exception of February and September (Figures 27-29). The pier end currents were consistently southward as during prior years. Anomalous southerly winds and mild southerly waves during February were responsible for the spring type currents during the month. Persistent northerly winds and waves during March resulted in the high means for the month. Likewise, persistent northerly winds and waves caused the current reversal during September.

All years combined

84. All locations show consistent temporal variations and distinct spatial differences in both magnitude and direction (Figure 30). Near zero annual means (Table 8) for both locations within the surf zone reflect the seasonal variations and frequent reversals caused by the varying wind and wave conditions at the FRF. These contrast with the consistently southward monthly mean currents at the pier end.

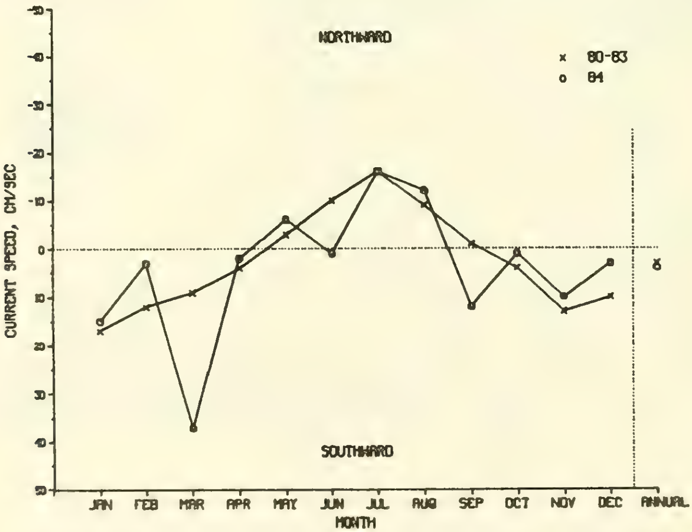


Figure 27. Comparison of surface currents at the beach 500 m updrift

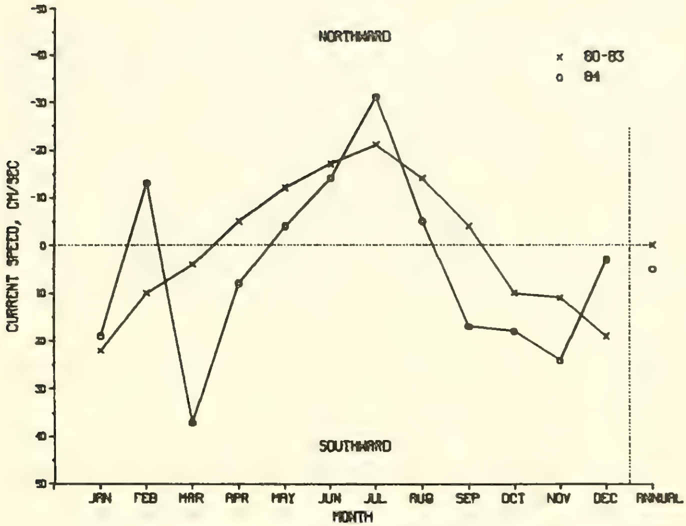


Figure 28. Comparison of surface currents at the pier midsurf location

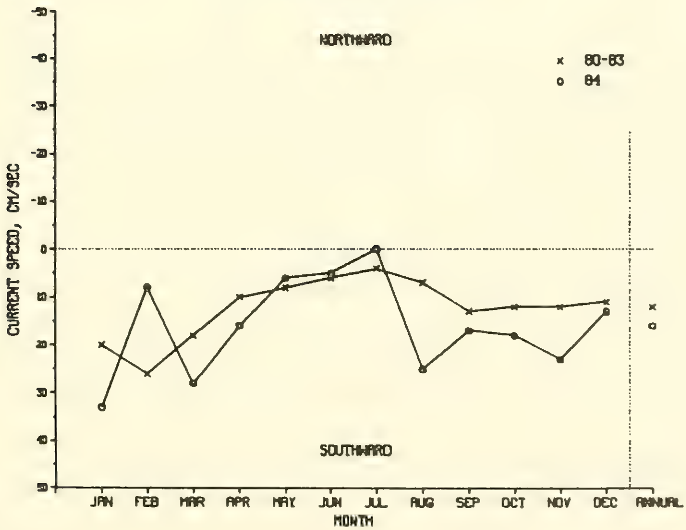


Figure 29. Comparison of surface currents at the seaward end of the pier

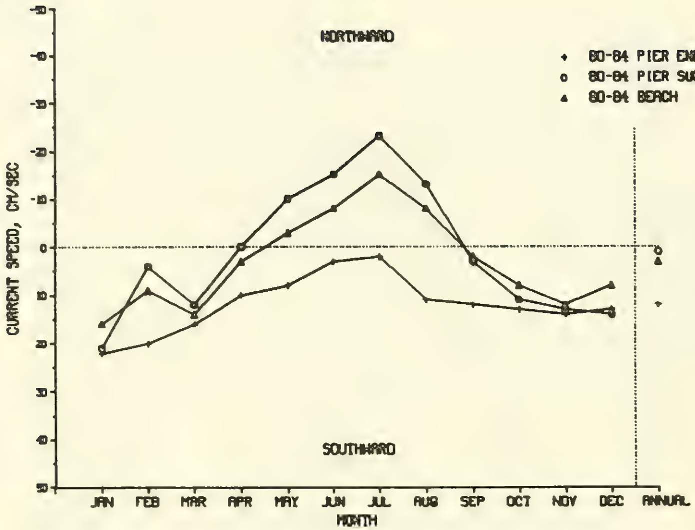


Figure 30. Mean surface currents, 1980-1984

Tides and Water Levels

85. Water level variations caused by astronomical and meteorological forces are discussed in this section. Results for 1984 are followed by a comparison with previous data. All tidal heights are referenced to NGVD unless otherwise stated.

Present data year

86. Tide height statistics for 1984 are presented in Table 9. Tides at the FRF are semidiurnal with both daily high and low tides approximately equal. The annual mean range was 97 cm while msl was 16 cm above NGVD. The highest water level, 147 cm, for the year was measured on 14 October during the passage of Hurricane Josephine when waves in excess of 3.2 m were measured at the seaward end of the pier (Part VI). This extreme was within a few centimetres of the highest water level measured since 1978.

1984 versus past years

87. Although the 1984 msl was 5 cm above the annual average for 1979 through 1983, it was lower than the 1983 mean of 19 cm (Table 9 and Figure 31). In Figure 32 the distribution of daily high, daily low, and hourly

Table 9

1984 Mean Tide Height Statistics*

Month or Year	Mean High Water	Mean Tide Level	Mean Sea Level	Mean Low Water	Mean Range	Extreme High	Date	Extreme Low	Date
Jan	64	16	16	-32	96	119	19	-69	22
Feb	56	7	8	-41	98	108	18	-66	17
Mar	64	15	16	-33	97	105	29	-66	2
Apr	71	23	24	-25	96	123	15	-43	19
May	55	6	6	-43	98	102	31	-69	12
Jun	57	9	9	-39	96	100	1	-68	14
Jul	53	4	4	-45	98	100	29	-77	6
Aug	70	21	21	-28	98	107	25	-66	29
Sep	77	28	29	-21	98	129	27	-73	25
Oct	78	30	30	-18	96	147	14	-66	22
Nov	72	24	24	-23	95	110	23	-54	22
Dec	56	9	9	-38	94	99	23	-73	9
1984	64	16	16	-32	97	147	Oct	-77	Jul
1979-1983	61	10	11	-40	101	149	Nov 1981	-119	Mar 1981
1983	68	19	19	-30	98	143	Jan	-73	Mar
1982	58	8	9	-42	99	127	Oct	-108	Feb
1981	59	8	9	-42	101	149	Nov	-110	Apr
1980	59	8	8	-43	102	118	Mar	-119	Mar
1979	60	9	9	-43	103	121	Feb	-95	Sep

* Measurements are in centimetres.

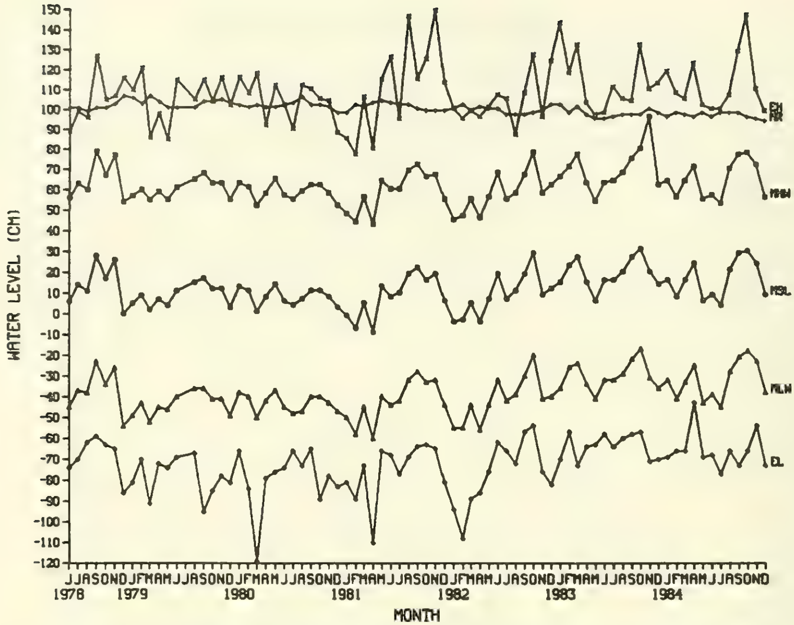


Figure 31. Monthly tide and water level statistics, 1978-1984

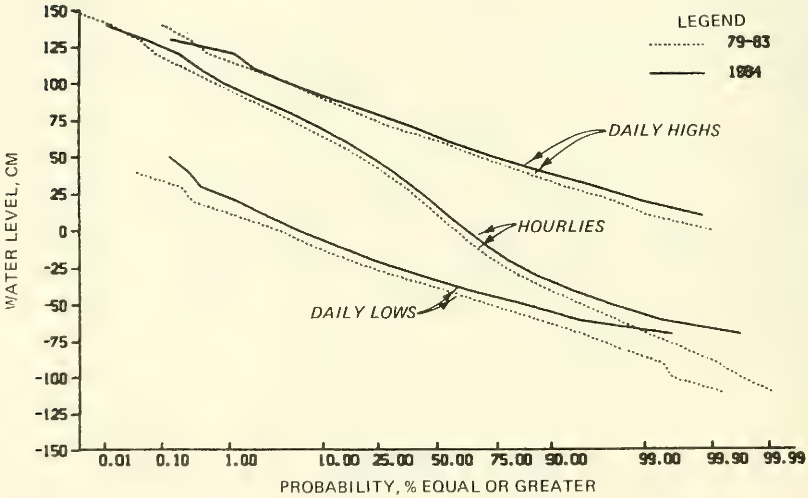


Figure 32. Comparison of hourly tide heights and daily high and low water level distributions, 1979-1984

tidal heights for 1984 and prior years is presented for comparison. The curves show the effect of the 5-cm mean variation and the tendency for the daily lows to be somewhat higher than for prior years.

All years combined

88. Based on the distribution of the tide heights for 1980-1984 (Figure 33), the tide can be expected to exceed 110 cm for 0.28 percent of the time (25 hr). Likewise, the heights can be expected to be less than -80 cm for 0.23 percent of the time (20 hr).

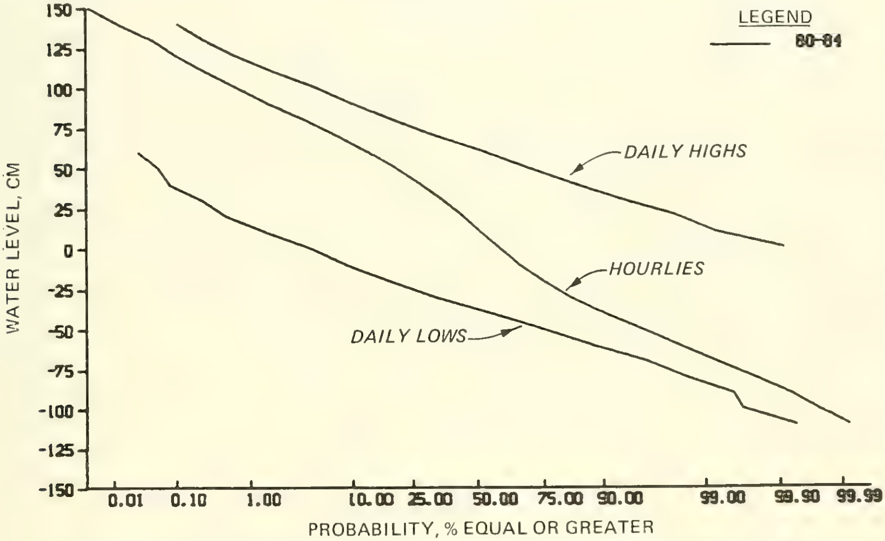


Figure 33. Distribution of hourly tide heights and daily high and low water levels, 1980-1984

Water Characteristics

89. The results of daily measurements of surface water temperature, visibility, and density are presented in this section. The summaries represent single observations made near 0700 EST and, therefore, may not reflect daily average conditions since such characteristics can change rapidly within a 24-hr period. A discussion of data collected in 1984 is followed by a comparison with previous years.

Water temperature

90. Present year. Daily sea surface water temperatures at the seaward end of the FRF pier (Figure 34) experienced large variations during May through July. Large variations were common when there were large differences between the air and water temperature and the wind direction varied. For example, very high water temperatures were measured from 20 through 23 June. This was caused by air temperatures in excess of 31° C that heated the surface water prior to persistent onshore winds that piled up warm surface water along the shoreline. When the winds were offshore, the colder bottom water circulated up resulting in low temperatures. Monthly mean temperatures (Table 10) varied with the air temperatures (see Table 3) with approximately a 1-month lag.

91. 1984 versus prior years. Although the site experienced a cold January, cool July, and warm August, the water temperatures during other months of the year were similar to prior years (Figure 35).

92. All years combined. The distribution of surface water temperatures for all years combined is shown in Figure 36. Temperatures in excess of 25° C can be expected 4.7 percent of the time (or 17 days per year), while temperatures below 4° C can be expected 21 days per year.

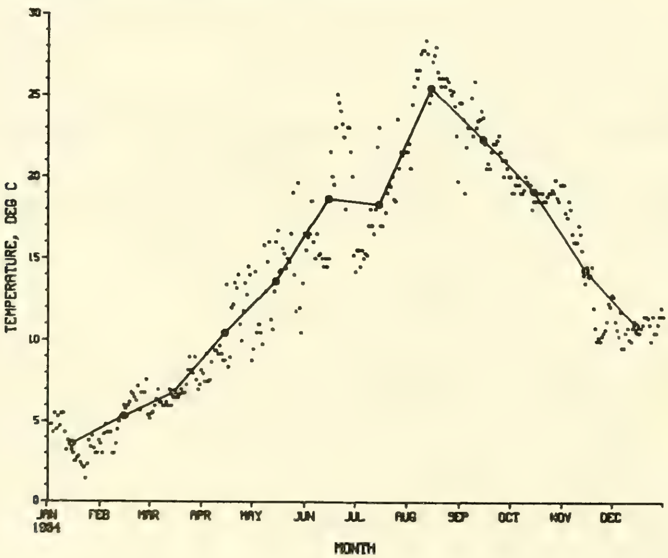


Figure 34. Daily sea surface water temperatures, 1984

Table 10

Mean Surface Water Characteristics Measured at the Seaward End of the FRF Pier

Month	Temperature, °C			Visibility, m			Density, g/cm^3		
	1984	1980–1983	1980–1984	1984	1980–1983	1980–1984	1984	1980–1983	1980–1984
Jan	3.6	5.3	5.0	1.0	1.3	1.2	1.0215	1.0245	1.0238
Feb	5.3	4.4	4.6	2.2	1.4	1.5	1.0226	1.0241	1.0237
Mar	6.8	6.2	6.3	1.8	1.2	1.4	1.0224	1.0236	1.0233
Apr	10.5	10.5	10.5	1.4	2.1	2.0	1.0192	1.0243	1.0231
May	13.6	15.2	14.8	2.1	2.5	2.4	1.0217	1.0235	1.0230
Jun	18.6	19.6	19.4	3.6	3.5	3.6	1.0215	1.0215	1.0215
Jul	18.3	22.3	21.5	3.3	3.8	3.7	1.0239	1.0212	1.0219
Aug	25.4	22.3	23.0	3.2	2.9	3.0	1.0179	1.0216	1.0207
Sep	22.3	22.7	22.6	1.8	1.9	1.9	1.0205	1.0216	1.0213
Oct	19.1	18.7	18.8	0.9	1.2	1.1	1.0216	1.0224	1.0222
Nov	14.3	13.9	14.0	0.6	1.0	0.9	1.0230	1.0236	1.0235
Dec	11.0	9.7	10.0	1.5	1.0	1.1	1.0237	1.0241	1.0240
Annual	14.1	14.2	14.2	1.9	2.2	2.0	1.0216	1.0230	1.0227

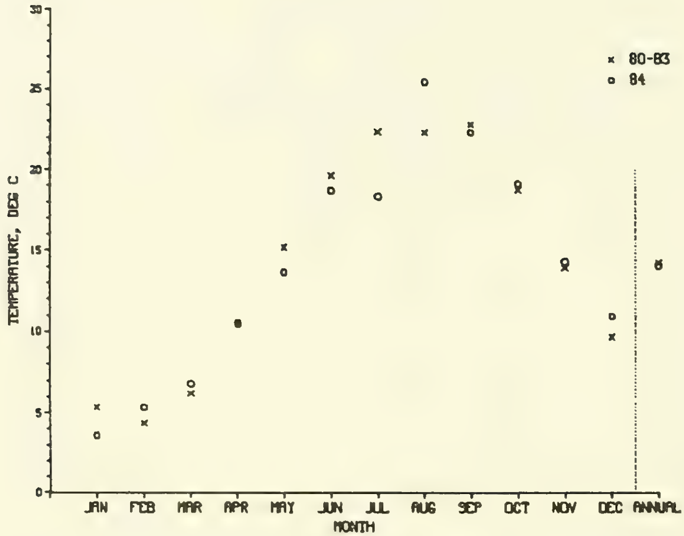


Figure 35. Comparison of mean surface water temperatures

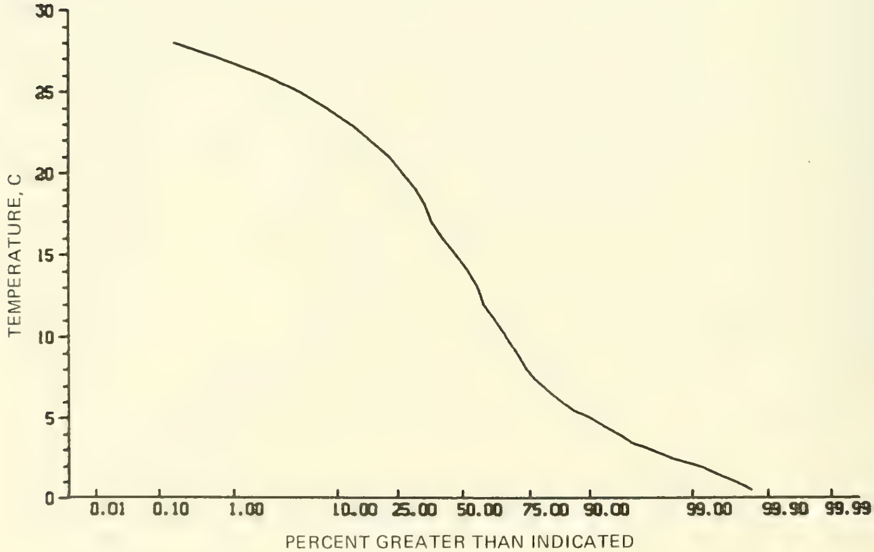


Figure 36. Distribution of surface water temperatures, 1980-1984

Visibility

93. Visibility in coastal nearshore waters depends on the amount of salts, soluble organic material, detritus, living organisms, and inorganic particles in the water. These dissolved and suspended materials change the absorption and attenuation characteristics of the water, which vary daily and throughout the year.

94. Like water temperature, visibility is related to onshore and offshore winds. Onshore winds move warm clean water towards shore, while offshore winds bring up colder bottom water with large concentrations of suspended matter.

95. Present data year. Figure 37 shows daily visibility values for the year. Between June and September, the visibility was occasionally above 6 m; however, visibility was less than 2 m approximately just as often during those months. Table 10 shows the monthly means for the year.

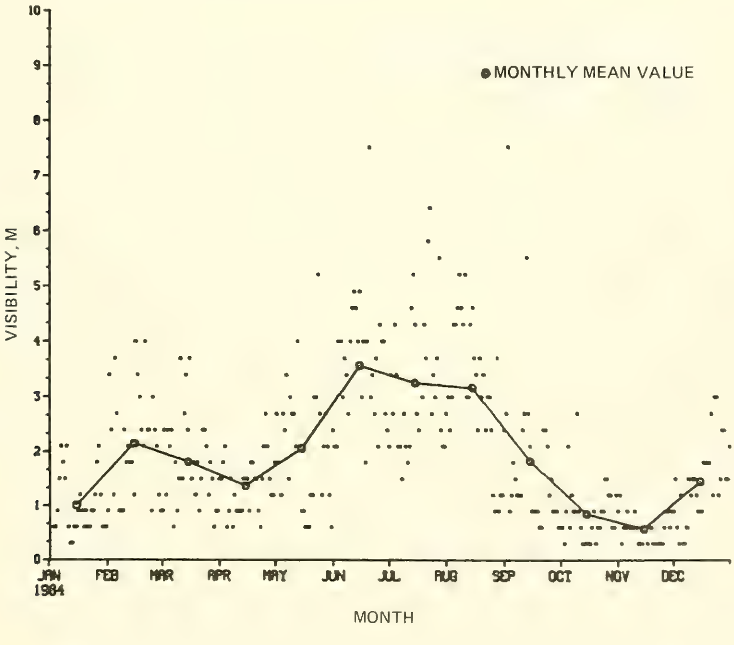


Figure 37. Daily sea surface water visibility, 1984

96. 1984 versus prior years. Variation of the monthly mean visibility during 1984 was similar to prior years (Figure 38). Unusually good visibility during February and March was because of the mild wave conditions and the predominantly onshore, southerly winds.

97. All years combined. Figure 39 shows the distribution of daily values for 1980 through 1984. For 121 days a year, the visibility at the FRF can be expected to be less than 1 m; while for 82 days a year, the visibility can be expected to exceed 3 m.

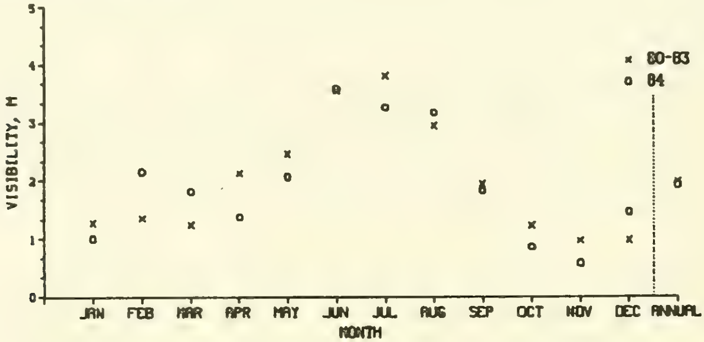


Figure 38. Comparison of mean surface water visibility

Density

98. Present year. Daily density values show large daily variations (Figure 40). Table 10 gives the monthly means for the year. Some density values were low during the spring and summer; however, the means did not follow a consistent pattern. The very low density values during August and on 2 September were neither times of heavy rain fall nor times of abnormally high water temperatures. These values tend to occur when the wave angles are very large, approaching from north-northeast. This may create a southerly flow along the coast that brings relatively fresh water from the Chesapeake Bay as far south as the FRF; on numerous occasions plumes of fresh water from the bay have been observed moving south past the FRF.

99. 1984 versus prior years. The mean monthly water density throughout 1984 was much lower than for prior years, especially during April and August (Figure 41). Since water temperature did not show a corresponding difference, the reason for the difference is unknown.

100. All years combined. The distribution of daily surface water density for 1981 through 1984 is shown in Figure 42. Density values lower than

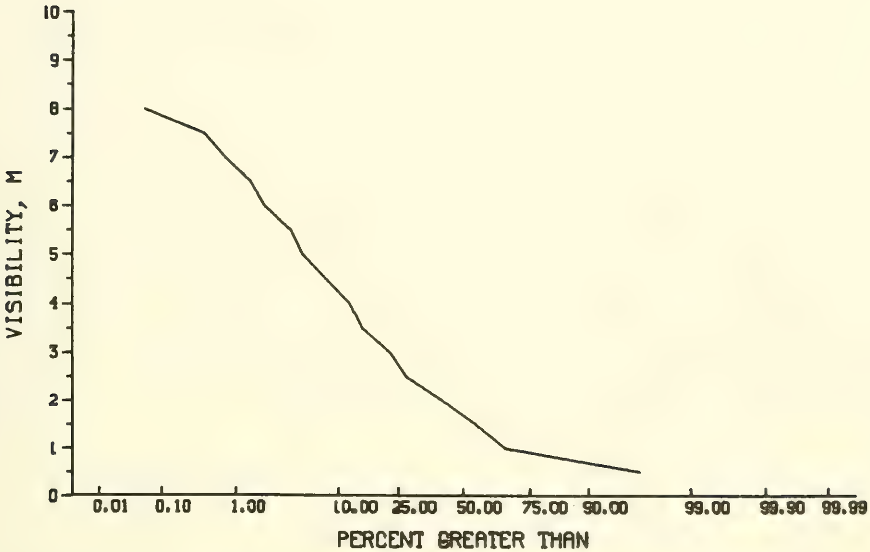


Figure 39. Distribution of surface water visibility, 1980-1984

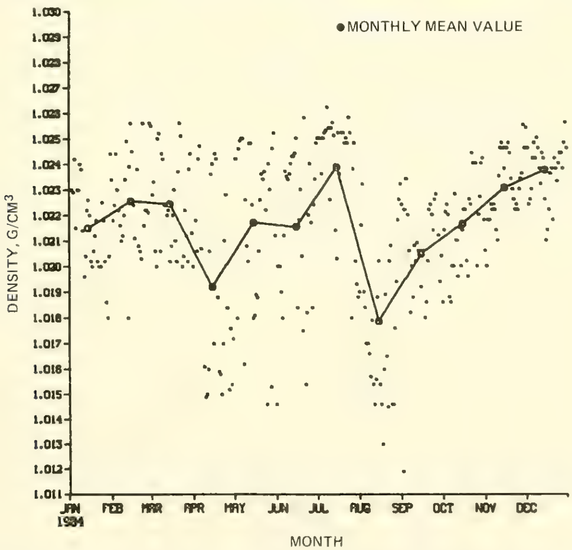


Figure 40. Daily sea surface water density, 1984

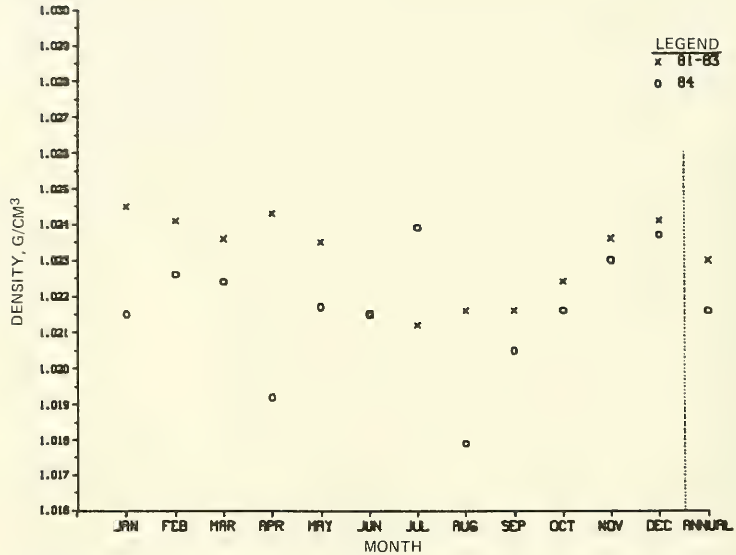


Figure 41. Comparison of mean sea surface water density

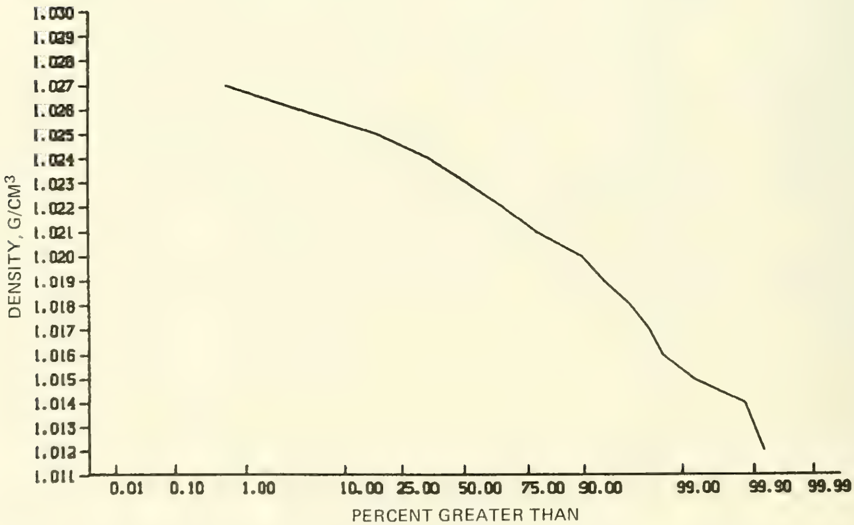


Figure 42. Distribution of surface water density, 1981-1984

1.019 g/cm^3 occur less than 7 percent of the time. Values less than 1.016 g/cm^3, which occurred only during the summer of 1984, account for only 1.7 percent of all measurements to date.

Surveys

101. Waves and currents interacting with bottom sediments produce changes in the beach and nearshore bathymetry. These changes can occur very rapidly in response to storms or slowly as a result of persistent but less forceful seasonal variations in wave and current conditions.

102. To document the temporal and spatial variability in bathymetry, surveys were conducted approximately monthly of an area extending 600 m north and south of the pier and approximately 950 m offshore. In addition, monthly soundings were taken along both sides of the pier.

103. A brief discussion of the effect of the research pier on the surrounding bathymetry precedes discussions of time-histories of bottom elevations at selected locations along the pier and contour diagrams of the bathymetry.

Pier effect

104. The research pier introduces a perturbation in bathymetry (Figure 43) in the form of a permanent trough under the pier, apparently a result of the interaction of waves and currents with the pilings. The trough deepens under the seaward end of the pier and varies in shape and depth with changing wave and current conditions. The pier's effect on shore-parallel contours occurs as far as 300 m away, and the shoreline may be affected up to 350 m from the pier (Miller, Birkemeier, and DeWall 1983).

History of bottom elevation

105. A history of the bottom elevations is presented at the Baylor wave gage locations, pier sta 6+20 (189 m) and 19+00 (579 m) (Figure 44). This information is useful for interpretation of the wave data from gages 625 and 615 located under the pier. Histories at intermediate locations at 323 and 433 m are also included (Figure 44). Variations of elevation under the pier are caused by natural processes (such as profile changes caused by bar movement) as well as scour caused by the interaction of the pier piles with waves and currents. Throughout the year the depth of the scour hole at the seaward end of the pier varied approximately 0.6 m. This is relatively low in

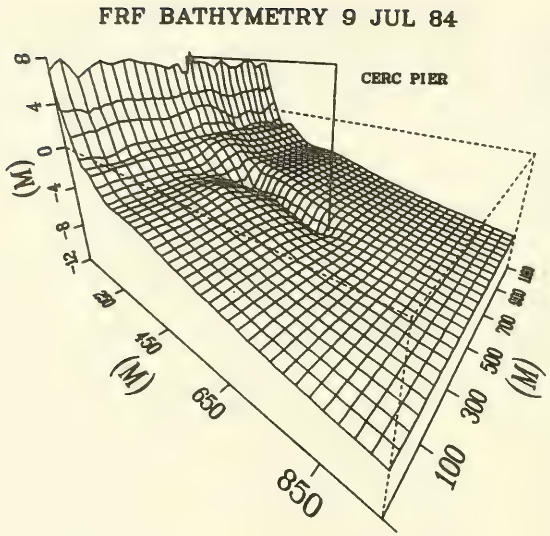


Figure 43. Permanent trough under the FRF pier
(9 July 1984)

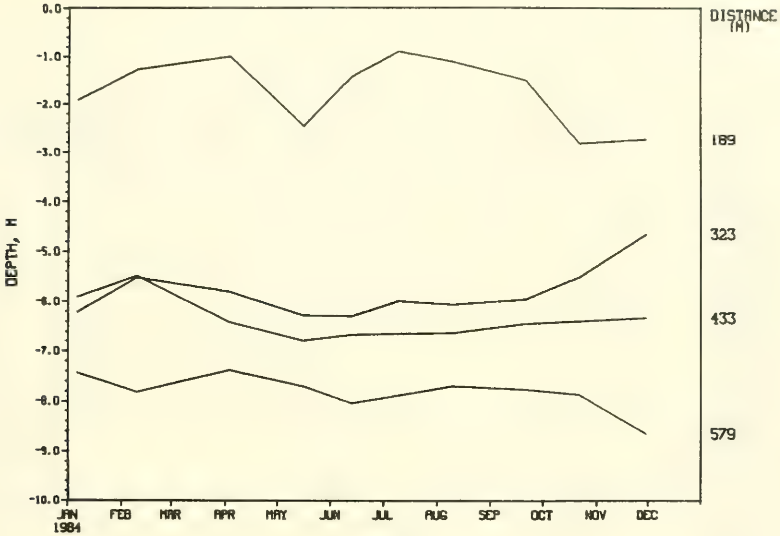
comparison with prior years when the variation was observed to exceed 2 m in a year.

106. At 189 m, the depth variation exceeded 1.5 m. The accumulation of 0.75 m of sediment during January was caused by erosion of the inshore. Wave heights were relatively low during February and March, maintaining sediment nearshore. The May survey was completed shortly after a mild storm which produced slightly above mean wave conditions. However, because of the abundance of sediment at the time, significant erosion occurred. During the summer the sediment was restored. A storm in October scoured the sediment from the trough under the pier. Measured depth at the other positions on the pier remained relatively constant.

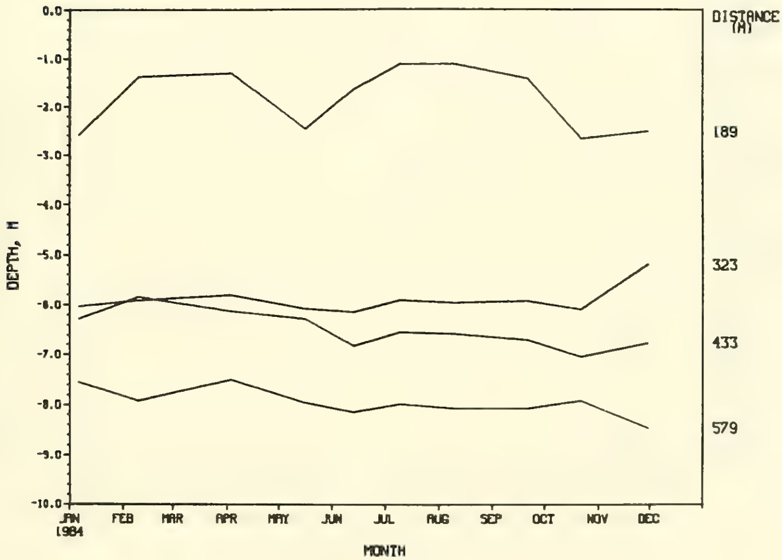
Bathymetry

107. Contour diagrams created from the data obtained during the bathymetric surveys are presented in Appendix C; characteristics of the bathymetric conditions are discussed below. Figure 45 shows the locations of the surveyed profile lines.

108. The first survey of the year, completed on 5 January, showed an asymmetric trough under the pier with an inshore end that elongated to the



a. North



b. South

Figure 44. Time-history of bottom elevations at selected locations under the FRF pier

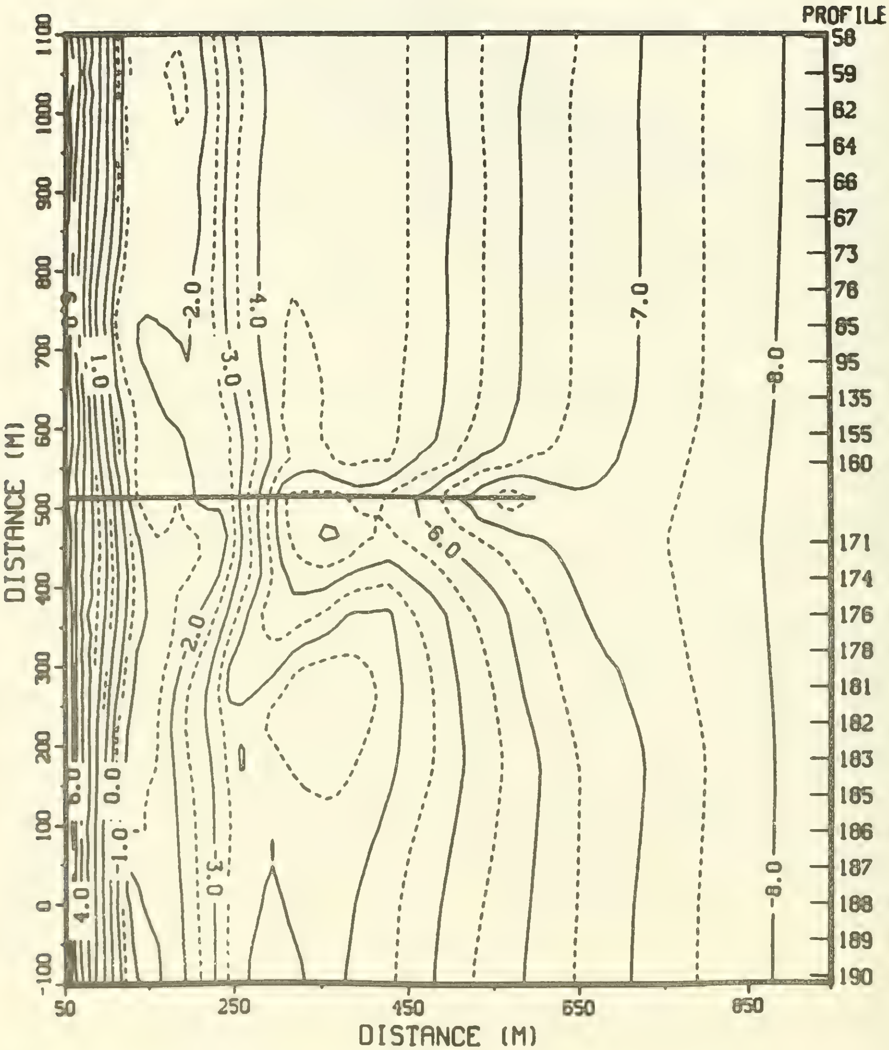


Figure 45. Profile locations at the FRF (contours in metres)

south and a large shoal from 100 to 400 m south of the pier, centered 350 m from shore.

109. The next survey completed on 9 February shows the trough elongating further to the south and as much as 0.75 m of erosion to the shoal on the south side of the pier. Sediment eroded from the shoal was deposited inshore on the beach as well as seaward.

110. An unseasonably high occurrence of waves from the south during March resulted in up to 0.75 m of accretion south of the pier, thus making the trough more symmetric. In addition, as much as 1.5 m of sediment was deposited north of the pier, building a shoal out to the 4-m depth. North of the pier (300 m), extensive erosion was measured offshore (50 to 250 m). A similar erosion/accretion pattern has been observed during some summers. This pattern usually is associated with low-to-moderate wave heights from predominantly southerly directions, as occurred during this March. These waves have insufficient energy to maintain the northerly flow of sediment along the shore through the pier, and thus accretion occurs. Waves reaching the beach north of the pier's influence cause localized erosion because of the lack of sediment from the south.

111. The May survey showed a shallow, symmetric trough under the pier and up to 1.25 m of accretion along the beach from 50 to 200 m offshore with a corresponding erosion of the nearshore bar at 250 m.

112. In June, the trough was relatively shallow and symmetric. Only minor changes have occurred since the last survey.

113. Low wave conditions persisted through June, July, and the first part of August as reflected in the minor accretion of sediments on the beach and otherwise minimal changes to the bathymetry measured during those months. A small shallow fillet at the landward end of the pier developed during this time.

114. The bathymetric survey completed on 20 September showed a slightly asymmetric trough under the pier and cuts in the bathymetry at the shoreline. The trough, although relatively shallow, was steeper on the north side of the pier than on the south. Landward of 250 m (approximately the -3 m depth) there were cuts or nearshore troughs centered 300 m north and south of the pier. Similar cuts have been observed north of the pier during previous summers when wave conditions were persistently less than 1 m and unidirectional (Miller, Birkemeier, and DeWall 1983). Since the prior survey on 11 August,

up to 0.75 m of erosion occurred along the shoreline and foreshore with deposition on the nearshore bar.

115. Post-Hurricane Josephine bathymetry of 16 October exhibited major changes from the September survey (Figure 46). Up to 1 m of erosion occurred in an area 200 m either side of the landward end of the pier, extending between 50 and 250 m from the baseline. Areas of similar erosion, produced by the extensive nearshore bar development, occurred at the north and south ends of the survey region, with as much as 1 m of accretion occurring about 250 m from the baseline. The scour hole at the seaward end of the pier deepened about 0.25 m because of the high waves.

116. The final survey of the year was completed on 27 November. High waves experienced at the FRF on a number of occasions prior to the survey caused the trough to elongate to the south near 350 m from the baseline. A rip channel developed to the south of the pier as evident from the bending of the 3- to 5-m contours at 300 m from the pier. An unusual shore-parallel bar and trough system was also measured at the 2-m depth.

Photography

117. Two sets of photographic data were used to document nearshore and beach conditions in the vicinity of the FRF during 1984. Daily 35-mm transparencies were taken of the beach from the pier looking both north and south (Figure 47). Quarterly aerial photographic missions were also flown as indicated in Table 11, usually at a scale of 1:12,000. Figure 48 is a sample of the imagery obtained (3 October 1984).

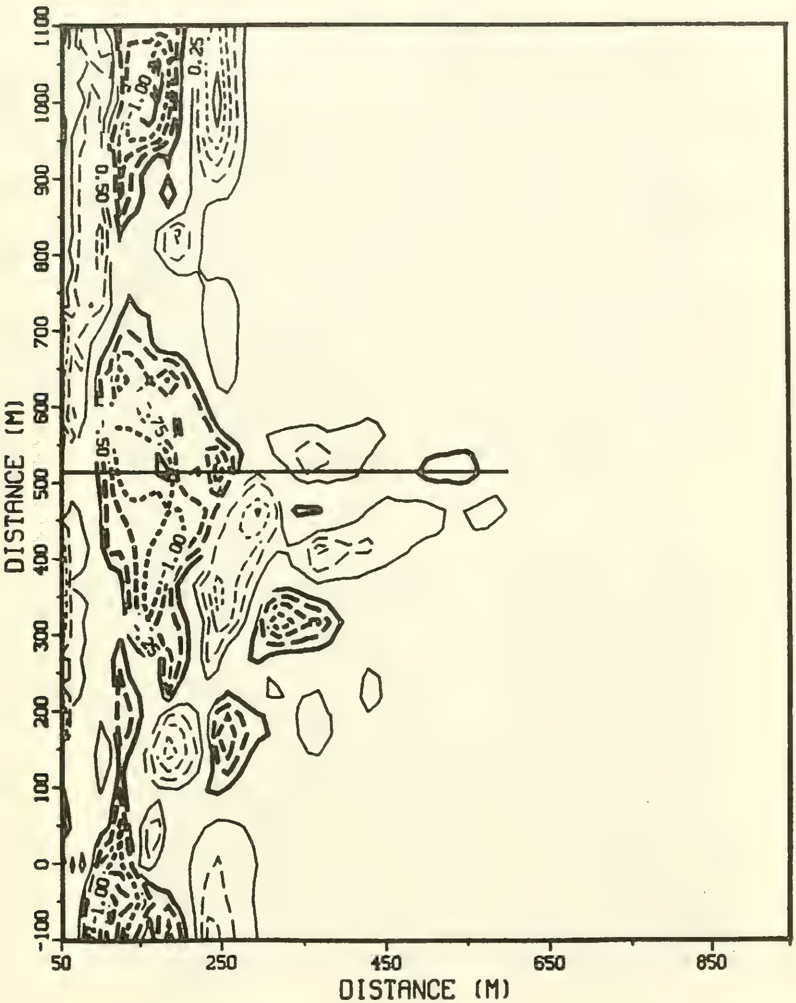


Figure 46. Change in FRF bathymetry between 20 September and 16 October 1984 caused by Hurricane Josephine (contours in metres)

a. North

b. South

Figure 47. Sample photographs of the FRF beach taken on 26 November 1984

Table 11

Aerial Photography Inventory for 1984

Date	Coverage	Format
1 Feb	4 miles north to 5 miles south of pier	B/W and color
11 Apr	10 miles north to 10 miles south of pier	Color
7 Sep	Cape Henry, Va., to Cape Hatteras, N. C.	B/W
3 Oct	10 miles north to 10 miles south of pier	Color

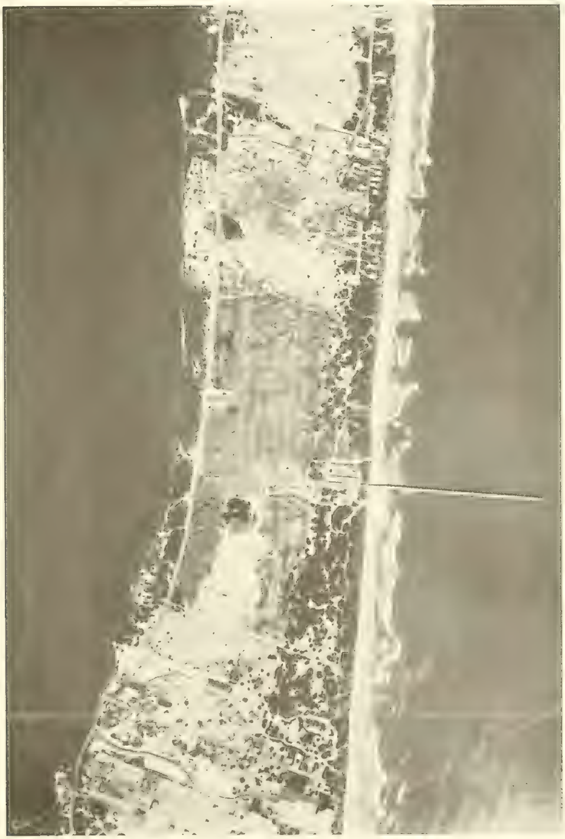


Figure 48. Sample aerial photograph taken 3 October 1984

PART VI: STORMS

118. This part discusses the details of storms affecting the FRF. As used here, "storms" are defined as times when the wave height parameter H_{m_o} equals or exceeds 2.0 m at the seaward end of the FRF pier. Hourly data collected during such times are presented in Appendix D. Sample spectra from the Baylor gage at the seaward end of the pier are given in Appendix B. Prestorm and/or poststorm bathymetry diagrams are given in Appendix C. Detailed information on the track of each storm was taken from the NOAA Daily Weather Maps and the NOAA Mariners Weather Log series Volumes 28 and 29 (US Department of Commerce 1984, 1984-1985).

119. There were 14 storms during the year: two had wave heights in excess of 2 m on 5 consecutive days, three for 2 days, and nine for a single day. This was a mild year in comparison with prior years which averaged 18 storms per year.

January 1984

1 January

120. The first storm formed as a frontal wave southwest of Bermuda on the 1st and tracked due north, moving past the FRF in 1 day.

11-15 January

121. This storm started as a low-pressure system that formed over the gulf coast. It moved east and offshore near South Carolina on the 11th. The storm continued to track east through the morning of the 12th then turned northeast. By this time, a large Canadian high-pressure system moved over New England where it remained through the 13th. On the 14th two new extratropical cyclones formed well east and offshore of the mid-Atlantic seaboard, helping to maintain high waves into the 15th.

February 1984

14-15 February

122. A frontal low-pressure system formed over South Carolina on the 13th and moved over eastern North Carolina producing high winds from the southeast on the 14th. The low tracked due north past the FRF on the 15th.

23 February

123. This low formed in the Gulf of Mexico on the 21st and moved north up the coast behind a cold front that moved offshore during the evening of the 22nd.

28 February

124. This huge low formed over Texas on the 25th. As it moved east it pushed a cold front offshore, then turned and tracked north, inland of the coast, behind the front. The storm was over North Carolina on the 28th producing high winds from the south.

13 March 1984

125. A Canadian high that moved east across the Great Lakes on the 12th was centered over Maine on the 13th.

31 May 1984

126. After forming over the gulf off the west coast of Florida, this low moved north along the coast behind a cold front which moved offshore. Centered off North Carolina on the 31st, the high winds produced the only storm of the spring of 1984.

September 1984

27 September

127. A Canadian high moved into the Midwest on the 25th and tracked east across the United States. On the 27th, while centered over the Great Lakes, the storm produced high winds from the north at the FRF before moving offshore.

29-30 September

128. A low formed in a frontal trough off the North Carolina-Virginia coast early on the 29th producing high northeasterly winds. At the same time Hurricane Isidore formed over Florida and was moving north behind the front associated with the low offshore of the FRF. Isidore tracked due north with the hurricane's center passing the FRF on the 30th.

October 1984

11-15 October

129. Hurricane Josephine formed as a tropical depression about 900 km east of Miami and moved northwest. The effects of Josephine were felt at the FRF early on the 11th when the hurricane center was off the Georgia-South Carolina coasts. A Canadian high which moved east across the Great Lakes slowed the northerly track of Josephine which drifted past the FRF from the 12th through the 14th. Although still producing high winds and waves at the FRF, the storm center was off New England by the 15th.

17-18 October

130. Two high-pressure systems, one which formed over Bermuda and one over Canada, combined to produce high winds and waves at the FRF.

November 1984

3 November

131. An arctic high moved southeast into New England behind a cold front which passed off the Atlantic seaboard early on the 3rd.

20 November

132. The effect of this huge arctic high was felt all the way to the North Carolina coast as the system moved south into the central states on the 20th.

6 December 1984

133. The only storm of the month was the result of a low that formed in the gulf and raced northward past the FRF on the 6th.

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APPENDIX A: WAVERIDER BUOY CALIBRATION INFORMATION

1. This appendix presents the calibration information required for the two Waverider buoy gages used during 1984 at the 3-km offshore installation. Table A1 lists the operational dates of each gage as well as the predeployment and postdeployment calibration dates.

Table A1

Operational/Calibration Dates for the Waverider Buoys Used at the FRF During 1984

Serial Number	Operational	Calibrated
67715-7	29 August 1983- 31 December 1983	1 December 1982 20 March 1984
	1 January 1984- 5 March 1984	1 December 1982 20 March 1984
66967	5 March 1984- 14 November 1984	1 December 1982
67715-7	5 December 1984- 31 December 1984	20 March 1984

2. The buoys were calibrated either at the National Oceanic and Atmospheric Administration (NOAA)/Engineering Support Office (ESO), Wave Instrument Facility (Ribe 1981),* or at Adamo Rupp Associates (ARA) in Solana Beach, Calif. Calibration results are presented in terms of two factors: (a) the Datawell-specified decrease in electronic sensitivity as a function of oscillation period error, and (b) a difference error based on deviations from (a) found during the calibrations. The corrections and their application are discussed below.

Datawell-Predicted Decrease in Sensitivity Error (DW)

3. Waverider buoy sensitivity $|A|$ for buoy electronics decreases with increasing period T of sinusoidal vertical motion according to Datawell as follows:

* References cited in this appendix are included in the References at the end of the main text.

$$/A/ = \frac{1}{\left[1 + \left(\frac{T}{T_o}\right)^4\right]^{1/2}} \tag{A1}$$

where T_o = 30.8 sec is a characteristic period provided by Datawell. The manufacturer states that this sensitivity decrease results in amplitude errors of less than 3 percent for oscillation (wave) periods less than 15 sec. Figures A1 and A2 present curves for the $DW = /A/ - 1$, the Datawell-predicted sensitivity decrease error, and, as can be seen, the actual sensitivity does not decrease with period according to the Datawell relationship (Equation A1) given above.

Difference Error (d)

4. The difference error d is the difference between the Datawell-predicted decrease in sensitivity error and that found from the actual buoy calibrations.

5. In Tables A2 and A3, DW and d are tabulated as a function of T for each buoy. The best accuracy would be obtained by choosing the calibration values nearest in time to the date of the measurements.

6. Since these error corrections are oscillation-period dependent, their application requires that the wave data be decomposed into amplitude coefficients or variance-spectrum coefficients for each frequency or period. A less accurate but also less complicated procedure would be to apply a single correction to the wave height H_{m_o} based on the peak-spectral wave period T_p. For correction of amplitudes or derived parameters linearly related to amplitude, a correction factor $F(T)$ can be obtained from the sum of DW and d by:

$$F(T) = \frac{1}{1 + (DW + d)} \tag{A2}$$

which can be applied by multiplying the uncorrected amplitude by $F(T)$ for T_p. For correction of parameters related to the square of the amplitude

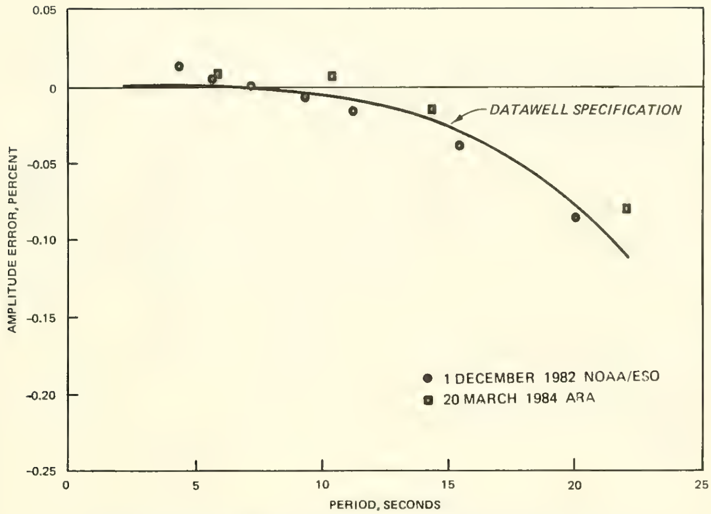


Figure A1. Waverider 67715-7 predeployment and postdeployment calibrations

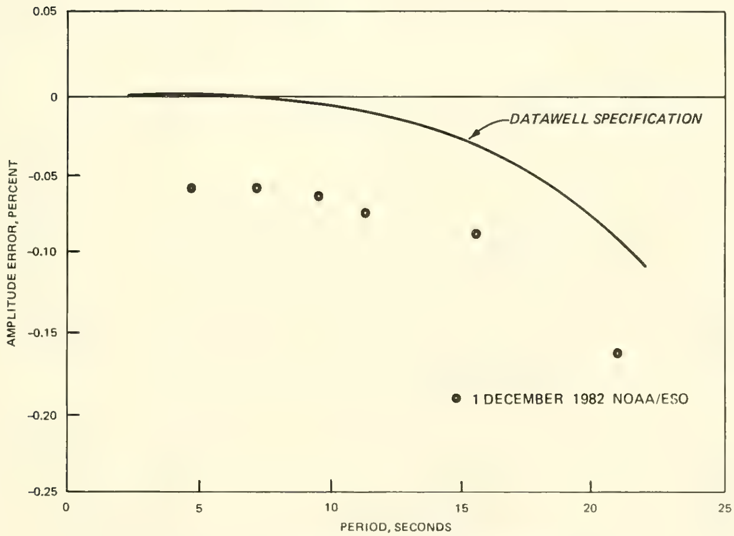


Figure A2. Waverider 66967 calibration for 1 December 1982

Table A2

Waverider 67715-7 Errors (Proportion)

Period, sec	Frequency, Hz	d	DW
	1 December 1982 Calibration		
20.17	0.050	-0.0058	-0.0809
15.56	0.064	-0.0106	-0.0310
11.33	0.088	-0.0076	-0.0090
9.40	0.106	-0.0021	-0.0043
7.25	0.138	+0.0030	-0.0015
5.90	0.169	+0.0052	-0.0007
4.66	0.215	+0.0127	-0.0002
	20 March 1984 Calibration		
22.2	0.045	+0.030	-0.1126
14.3	0.070	+0.009	-0.0225
10.5	0.095	+0.018	-0.0067
6.1	0.165	+0.008	-0.0008

Table A3

Waverider 66967 Errors (Proportion)

for 1 December 1982 Calibration

Period, sec	Frequency, Hz	d	DW
20.64	0.048	-0.0641	-0.0878
15.50	0.065	-0.0632	-0.0306
11.54	0.087	-0.0640	-0.0097
9.15	0.109	-0.0638	-0.0039
6.64	0.151	-0.0636	-0.0011
4.70	0.213	-0.0574	-0.0003

(i.e., total energy or variance spectrum coefficients), the following should be used:

$$\left[F(T)\right]^2 = \left[\frac{1}{1 + (DW + d)}\right]^2 \tag{A3}$$

7. To apply the correction, first the difference error between the Datawell-predicted error and the error measured during calibration is determined. The Datawell-predicted error and the difference error are summed, and the decrease in sensitivity (based on the wave period) is computed by adding 1 to the sum.

8. To demonstrate the use of the calibration results, the Waverider buoy recorded an H_{m_o} of 3.7 m and a T_p of 14 sec on 13 October 1984. From Figure A2 and Table A3 with calibration results for 1 December 1982, buoy 66967, the d for 14 sec is -0.0635 (interpolating from Table A3). This d is added to the DW of -0.0207 (Equation A1 minus 1.0), e.g., $-0.0635 + (-0.0207) = -0.0842$, and the sensitivity is computed by adding 1 or $1 + (-0.0842) = 0.9158$. This sensitivity is used to correct the $H_{m_o} = 3.7$ m, $T = 14$ sec as follows:

Uncorrected H_{m_o} divided by the sensitivity = corrected H_{m_o}

or

$$\frac{3.7 \text{ m}}{0.9158} = 4.04 \text{ m (8.4 percent increase)}$$

and the correction for a variance coefficient at this period is applied as:

$$\frac{\text{Uncorrected variance coefficient}}{(0.9158)^2}$$

9. In general, the wave statistics errors for 1984 are less than 7 percent for wave periods less than 12 sec and less than 10 percent for longer wave periods. Errors of this magnitude are generally tolerable for most engineering applications, although it is worthwhile to know the error

bounds for some design considerations. When warranted, the correction procedure presented in the above is recommended since these will produce increased magnitudes of the wave parameter. For statistics based on multiple years of data, the manufacturer's specified error is recommended for use in estimating a correction.

APPENDIX B: WAVE DATA

Wave data summaries for 1984 and climatological summaries for 1980 through 1984 are presented in this appendix. An explanation of the summary formats is followed by a list of tables and figures, then the data for gages 625, 620, and 615. Wave data are summarized in the following forms:

a. Gage histories. Table B1 includes information about the gages, gage installations, and major interruptions in the data collection. Short interruptions in the operational status of the gage are not mentioned.

b. Time-histories. A continuous display of individual wave height and peak spectral wave period values is plotted as a function of the time throughout the year (Figures B1, B20, and B33). Gaps indicate breaks in the data longer than 24 hr.

c. Annual, seasonal, and monthly maxima, mean, and standard deviations of wave height and peak period. The 1984 mean wave height and standard deviation, mean peak wave period and standard deviation, and extreme wave heights are listed in Tables B2, B12, and B22 and are plotted in Figures B2, B21, and B34. Combined statistics for 1980 through 1984 are given in Tables B7, B17, and B27 and are plotted in Figures B11, B27, and B40. Also included in the tables is the total number of observations obtained; at four observations per day, the maximum number of observations per month (based on a 30-day period) is 120. In the figures, the standard deviations are presented as vertical bars originating at the mean value and extending to the mean plus one standard deviation value. The extreme values are plotted above. No extreme period values are presented.

d. Joint distribution functions of wave height versus peak period. Annual, seasonal, and monthly joint distribution tables are presented for 1984 in Tables B3-B5, B13-B15, and B23-B25; data for 1980 through 1984 are presented in Tables B8-B10, B18-B20, and B28-B30. Each table gives the frequency (in parts per 1,000) for which the wave height and peak period were within the specified intervals; these values can be converted to percent by dividing by 10. Marginal totals are also included. The raw total gives the total number of observations out of 1,000 which fell within each specified peak period interval. The column total gives the number of observations out of 1,000 which fell within each specified wave height interval.

e. Cumulative distributions of wave height. For each gage, annual, seasonal, and monthly wave height distributions of 1984 are plotted in cumulative form in Figures B3-B5, B22-B24, and B35-B37. Data for 1980 through 1984 are in Figures B12-B14, B28-B30, and B41-B43.

f. Peak spectral wave period distributions. Annual, seasonal, and monthly peak wave period T_p distribution histograms for 1984 are presented in Figures B6-B8, B25, B26, B38, and B39; data for 1980 through 1984 are in Figures B15-B17, B31, B32, B44, and B45.

g. Persistence of wave heights. Tables B6, B16, and B26 show the number of times throughout 1984 when the specified wave height was equaled or exceeded at least once during each day for the duration (consecutive days) indicated; data for 1980 through 1984 are in Tables B11, B21, and B31. For example, Table B6 for gage 625 (pier-end Baylor) indicates wave heights equaled or exceeded 1.0 m 49 times for at least 1 day; 34 times for at least 2 days; 23 times for at least 3 days; 15 times for at least 4 days, etc. Therefore, on 15 occasions, the height equaled or exceeded 1.0 m for 1 day exactly; on 11 occasions for 2 days; on 8 occasions for 3 days, etc. Note that the height exceeded 1 m 49 times for 1 day or longer, while heights exceeded 0.5 m only 22 times for this same duration. This occurred because the longer durations of lower waves may be interspersed with shorter, but more frequent, intervals of higher waves. For example, the one time that wave heights exceeded 0.5 m for 62 days may represent 5 or 10 times the height exceeded 1 m for shorter durations.

h. Visual wave observation roses. Wave heights from the pier-end Baylor gage (625), and visually observed wave approach angles are combined to produce wave direction versus height distributions. Data for 1984 are in Figures B9 and B10, while 1980 through 1984 data are in Figures B18 and B19. The angles are referenced to true north. Northerly wave angles (e.g. less than 70 deg) generally produce southward currents while southerly wave angles greater than 70 deg produce northward currents.

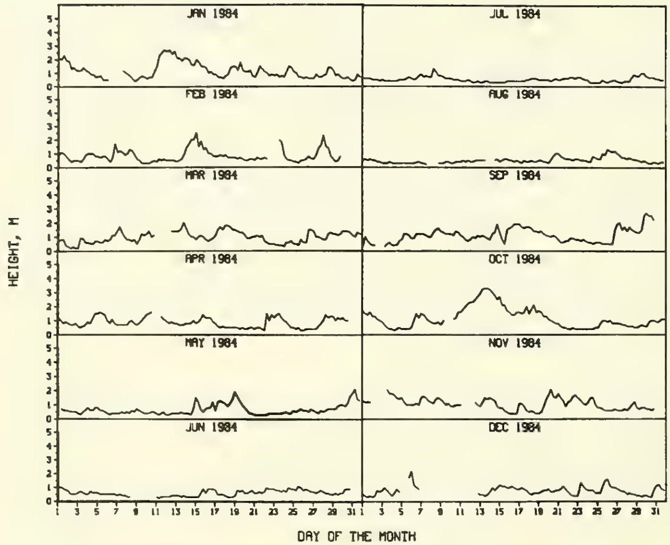
i. Spectra. Spectra for the pier-end Baylor gage (625) for days when wave heights exceeded 2 m are presented in Figure B46. The plots show energy density as a function of wave frequency.

Table B1

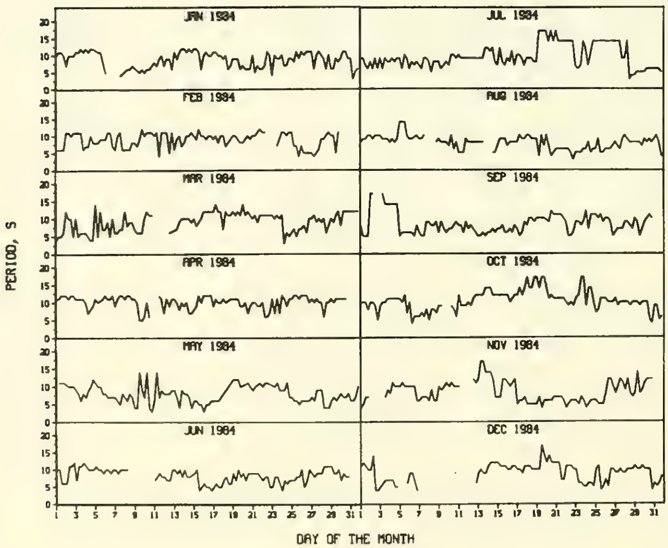
Wave Gage Histories for 1984*

Type of Gage	Location	Beginning of Proper Operation	End of Proper Operation	Explanation	Range m	Depth m	Distance from Shore
		Pier-End Baylor (Gage 625)					
Continuous wire staff	Pier sta 19+00 (579 m ENE of coordinates given)	Nov 78	18 Aug 84	Transducer failed	-2.1 to 7.0	8.2	475 m
		20 Aug 84					
		Offshore Waverider (Gage 620)					
Accelerometer buoy	36°11.1' N × 75°44.4' W (2.5 km ENE of seaward end of FRF pier)	Nov 78	5 Mar 83	Replaced buoy for routine maintenance	Continuous	18	3 km
		5 Mar 83	14 Nov 83	Buoy broke loose, never found			
		5 Dec 83	15 Dec 83	Buoy found on beach			
		18 Dec 83					
		Nearshore Baylor (Gage 615)					
Continuous wire staff	Pier sta 6+20 (189 m ENE of coordinates given)	Nov 78			-1.5 to 7.0	2.1	100 m

* Pier/baseline coordinates--36°10'54" N × 75°45'50" W.



a. Height



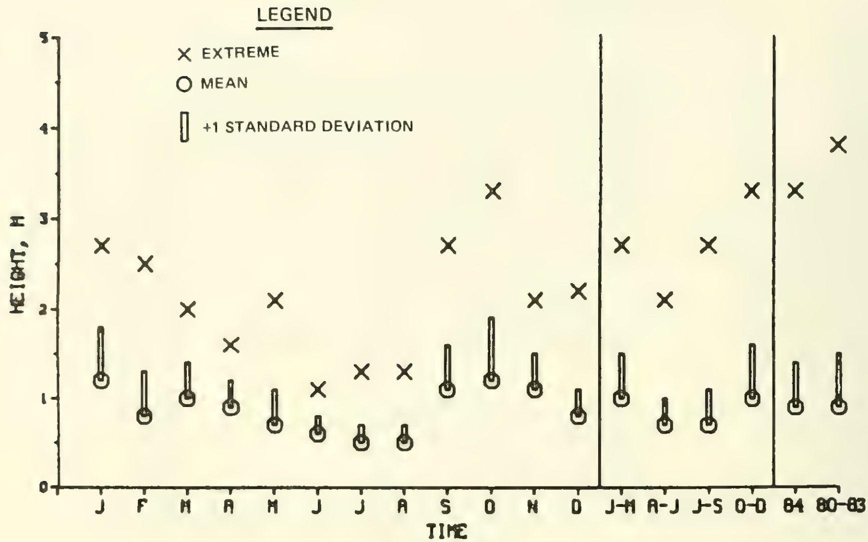
b. Period

Figure B1. Time-history of H_{m_o} and T_p for gage 625

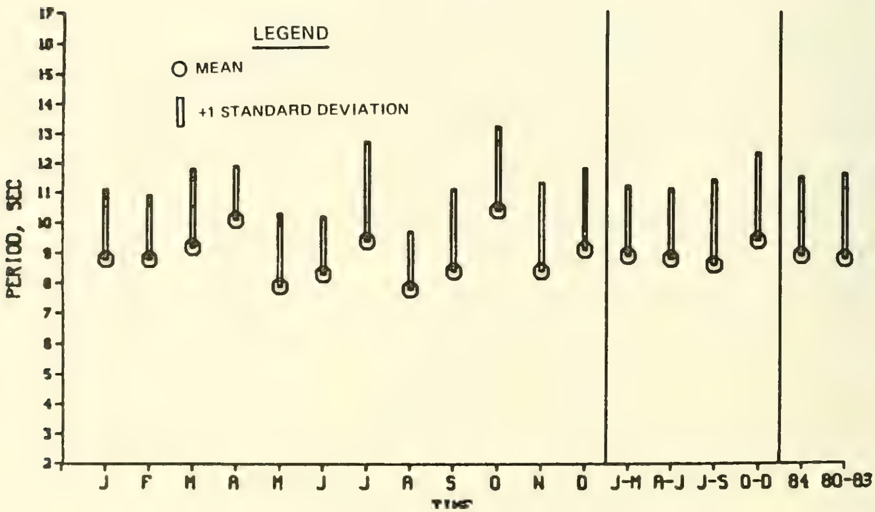
Table B2

1984 Mean, Standard Deviation, and Extreme H_{m_0} and T_p for Gage 625

Month	Mean Height, m	Standard Deviation Height, m	Mean Period sec	Standard Deviation Period sec	Extreme Height, m	Date	Number Observations
Jan	1.2	0.6	8.8	2.3	2.7	11	113
Feb	0.8	0.5	8.8	2.1	2.5	15	112
Mar	1.0	0.4	9.2	2.6	2.0	13	115
Apr	0.9	0.3	10.1	1.8	1.6	5	113
May	0.7	0.4	7.9	2.4	2.1	31	116
Jun	0.6	0.2	8.3	1.9	1.1	25	109
Jul	0.5	0.2	9.4	3.3	1.3	8	121
Aug	0.5	0.2	7.8	1.9	1.3	26	111
Sep	1.1	0.5	8.4	2.7	2.7	30	116
Oct	1.2	0.7	10.4	2.8	3.3	13	121
Nov	1.1	0.4	8.4	2.9	2.1	3	106
Dec	0.8	0.3	9.1	2.7	2.2	6	99
Jan-Mar	1.0	0.5	8.9	2.3	2.7	Jan	340
Apr-Jun	0.7	0.3	8.8	2.3	2.1	May	338
Jul-Sep	0.7	0.4	8.6	2.8	2.7	Sep	348
Oct-Dec	1.0	0.6	9.4	2.9	3.3	Oct	326
Annual	0.9	0.5	8.9	2.6	3.3	Oct	1,352



a. Height



b. Period

Figure B2. 1984 mean, standard deviation, and extreme H_{m_o} and T_p for gage 625

Table B3

1984 Annual Joint Distribution of H_{m_o} Versus T_p for Gage 625

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	1	4	8	18	28	37	40	22	10	15	4	187
.50 - .99	.	4	20	45	52	41	40	76	72	75	32	14	5	476
1.00 - 1.49	.	.	5	18	40	24	16	17	41	29	21	3	2	216
1.50 - 1.99	.	.	.	4	19	12	6	9	8	6	11	4	3	82
2.00 - 2.49	.	.	.	.	1	3	.	5	4	4	4	1	.	22
2.50 - 2.99	.	.	.	.	1	1	.	2	2	1	4	.	.	11
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	1	2	.	3
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	4	26	71	121	99	90	146	167	137	83	39	14	

Table B4

1984 Seasonal Joint Distribution of H_{m_o} Versus T_p for Gage 625

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	6	6	9	.	6	24	24	6	.	.	81
.50 - .99	.	6	21	44	56	29	35	62	79	115	29	3	.	479
1.00 - 1.49	.	.	3	9	56	26	15	26	59	41	38	3	.	276
1.50 - 1.99	.	.	.	.	12	18	3	18	12	15	21	3	.	102
2.00 - 2.49	.	.	.	.	.	6	.	9	9	15	9	.	.	48
2.50 - 2.99	.	.	.	.	3	3	.	6	6	.	.	.	.	18
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	6	24	59	133	91	53	127	189	210	103	9	0	

(Continued)

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	.	.	15	38	44	41	56	27	12	6	.	239
.50 - .99	.	6	33	44	50	59	38	92	83	107	41	3	.	556
1.00 - 1.49	.	.	.	6	24	27	15	.	30	38	27	.	.	167
1.50 - 1.99	.	.	.	.	12	.	3	3	6	6	6	.	.	36
2.00 - 2.49	.	.	.	.	3	.	.	.	.	.	.	.	.	3
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	6	33	50	104	124	100	136	175	178	86	9	0	

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	3	6	11	20	66	86	43	6	11	43	9	304
.50 - .99	.	6	11	52	78	43	60	95	32	20	6	40	17	460
1.00 - 1.49	.	.	.	32	37	20	23	23	17	3	3	.	.	158
1.50 - 1.99	.	.	.	9	17	11	11	9	3	.	.	.	.	60
2.00 - 2.49	.	.	.	.	.	3	.	.	3	.	.	.	.	6
2.50 - 2.99	.	.	.	.	.	3	.	3	3	3	.	.	.	12
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	6	14	99	143	100	160	216	101	32	20	83	26	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	.	6	.	6	.	12	37	34	12	9	6	122
.50 - .99	.	.	15	40	21	34	25	55	95	61	52	9	3	410
1.00 - 1.49	.	.	18	28	43	25	9	18	58	34	15	9	9	266
1.50 - 1.99	.	.	.	6	37	18	6	6	12	3	18	12	12	130
2.00 - 2.49	.	.	.	.	3	3	.	12	3	.	6	6	.	33
2.50 - 2.99	.	.	.	.	.	.	.	.	.	3	15	.	.	18
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	6	9	.	15
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	33	80	104	86	40	103	205	135	124	54	30	

Table B5

1984 Monthly Joint Distribution of H_{m_o}

Versus T_p for Gage 625

MONTH JAN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	9	.	9	.	.	.	.	.	18
.50 - .99	.	9	9	35	80	.	9	71	97	124	18	.	.	452
1.00 - 1.49	.	.	9	9	71	35	9	27	53	35	18	.	.	266
1.50 - 1.99	.	.	.	.	9	35	9	18	9	27	18	.	.	125
2.00 - 2.49	.	.	.	.	.	9	.	18	9	35	27	.	.	98
2.50 - 2.99	.	.	.	.	9	9	.	18	9	.	.	.	.	45
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	18	44	169	97	27	161	177	221	81	0	0	

MONTH FEB
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	9	18	.	9	27	54	9	.	.	126
.50 - .99	.	.	27	54	36	36	80	80	116	170	9	.	.	608
1.00 - 1.49	.	.	.	9	54	18	9	9	54	9	.	.	.	162
1.50 - 1.99	.	.	.	.	9	9	.	27	9	.	9	.	.	63
2.00 - 2.49	.	.	.	.	.	9	.	9	9	9	.	.	.	36
2.50 - 2.99	.	.	.	.	.	.	.	.	9	.	.	.	.	9
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	27	63	108	90	89	134	224	242	27	0	0	

MONTH MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	17	9	.	.	.	43	17	9	.	.	95
.50 - .99	.	9	26	43	52	52	17	35	26	52	61	9	.	382
1.00 - 1.49	.	.	.	9	43	26	26	43	70	78	96	9	.	400
1.50 - 1.99	.	.	.	.	17	9	.	9	17	17	35	9	.	113
2.00 - 2.49	.	.	.	.	.	.	.	.	9	.	.	.	.	9
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	26	69	121	87	43	87	165	164	201	27	0	

(Continued)

(Sheet 1 of 4)

Table B5 (Continued)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	.	.	.	.	.	18	44	27	35	.	.	124
.50 - .99	.	.	.	.	.	27	18	80	88	195	97	.	.	505
1.00 - 1.49	.	.	.	18	27	44	.	.	44	106	71	.	.	310
1.50 - 1.99	.	.	.	.	18	.	.	9	18	18	.	.	.	63
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	0	18	45	71	18	107	194	346	203	0	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	.	.	26	78	69	69	34	52	.	17	.	345
.50 - .99	.	17	69	52	95	60	26	52	52	34	9	9	.	475
1.00 - 1.49	.	.	.	.	34	34	17	.	26	9	9	.	.	129
1.50 - 1.99	.	.	.	.	17	.	9	.	.	.	17	.	.	43
2.00 - 2.49	.	.	.	.	9	.	.	.	.	.	.	.	.	9
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	17	69	52	181	172	121	121	112	95	35	26	0	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	.	.	18	37	64	37	92	.	.	.	.	248
.50 - .99	.	.	28	83	55	92	73	147	110	92	18	.	.	698
1.00 - 1.49	.	.	.	.	9	.	28	.	18	.	.	.	.	55
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	28	83	82	129	165	184	220	92	18	0	0	

(Continued)

Table B5 (Continued)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	.	.	17	33	50	124	25	17	33	83	.	382
.50 - .99	.	8	17	25	107	66	74	116	25	.	8	91	50	587
1.00 - 1.49	.	.	.	25	.	.	8	.	.	.	.	.	.	33
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	8	17	50	124	99	132	240	50	17	41	174	50	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	9	18	18	27	144	135	108	.	.	18	.	477
.50 - .99	.	9	18	81	81	27	90	108	36	.	.	.	.	450
1.00 - 1.49	.	.	.	18	36	9	9	.	.	.	.	.	.	72
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	27	117	135	63	243	243	144	0	0	18	0	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	.	.	.	.	9	.	.	.	.	26	26	61
.50 - .99	.	.	.	52	43	34	17	60	34	60	9	26	.	335
1.00 - 1.49	.	.	.	52	78	52	52	69	52	9	9	.	.	373
1.50 - 1.99	.	.	.	26	52	34	34	26	9	.	.	.	.	181
2.00 - 2.49	.	.	.	.	.	9	.	.	9	.	.	.	.	18
2.50 - 2.99	.	.	.	.	.	9	.	9	9	9	.	.	.	36
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	0	130	173	138	112	164	113	78	18	52	26	

(Continued)

(Sheet 3 of 4)

Table B5 (Concluded)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	.	.	.	.	.	8	.	25	17	50	17	17	17	151
.50 - .99	.	.	.	8	.	17	25	58	140	66	8	.	.	322
1.00 - 1.49	.	.	17	25	25	8	17	25	41	33	.	8	17	216
1.50 - 1.99	.	.	.	.	25	.	8	8	17	.	50	25	25	158
2.00 - 2.49	.	.	.	.	.	.	.	25	8	.	17	17	.	67
2.50 - 2.99	.	.	.	.	.	.	.	.	.	8	41	.	.	49
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	17	25	.	42
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	17	33	50	33	50	141	223	157	150	92	59	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	.	.	.	19	.	.	.	.	9	9	9	.	.	46
.50 - .99	.	.	9	57	28	47	38	19	28	28	94	9	.	357
1.00 - 1.49	.	.	28	38	66	57	9	19	85	28	19	19	9	377
1.50 - 1.99	.	.	.	9	75	47	9	9	19	9	.	9	9	195
2.00 - 2.49	.	.	.	.	9	9	.	.	.	.	.	.	.	18
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	37	123	178	160	56	47	141	74	122	37	18	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	.	.	.	.	.	10	.	10	91	40	10	10	.	171
.50 - .99	.	.	40	61	40	40	10	91	111	91	61	20	10	575
1.00 - 1.49	.	.	10	20	40	10	.	10	51	40	30	.	.	211
1.50 - 1.99	.	.	.	10	10	10	.	.	.	.	.	.	.	30
2.00 - 2.49	.	.	.	.	.	.	.	10	.	.	.	.	.	10
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	50	91	90	70	10	121	253	171	101	30	10	

(Sheet 4 of 4)

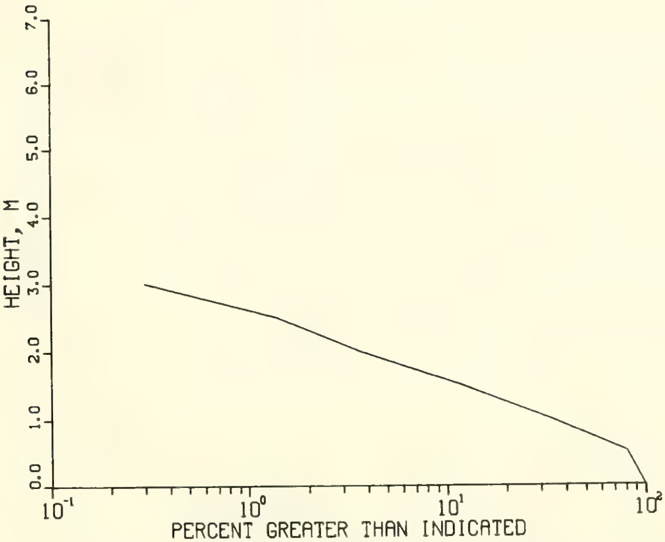


Figure B3. 1984 annual cumulative distribution of H_{m_o} for gage 625

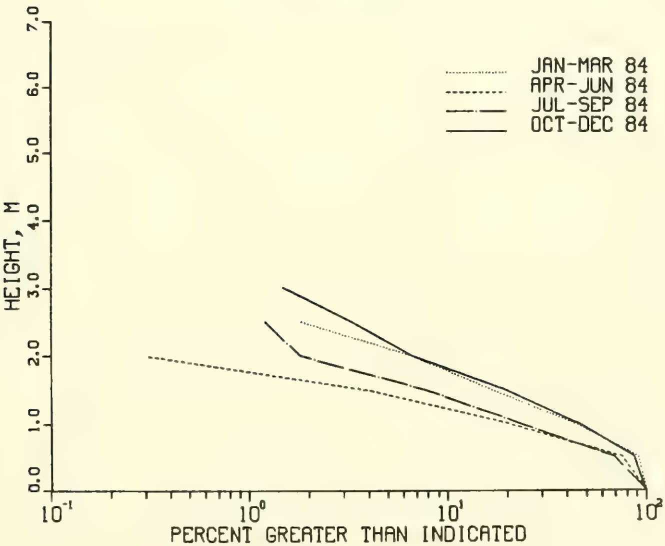
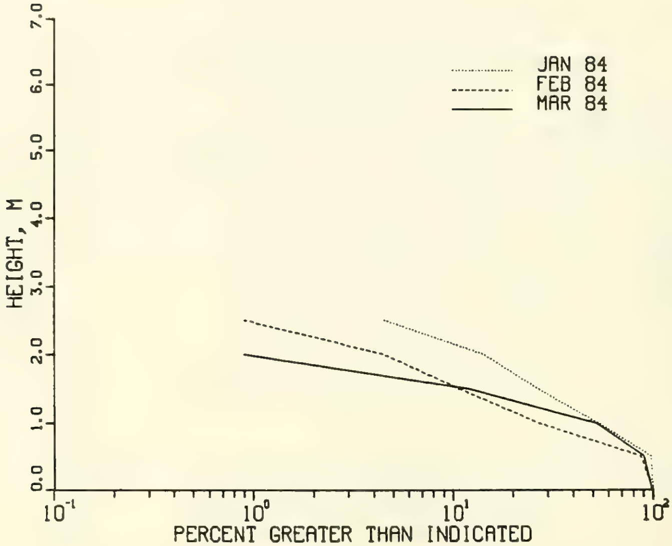


Figure B4. 1984 seasonal cumulative distribution of H_{m_o} for gage 625



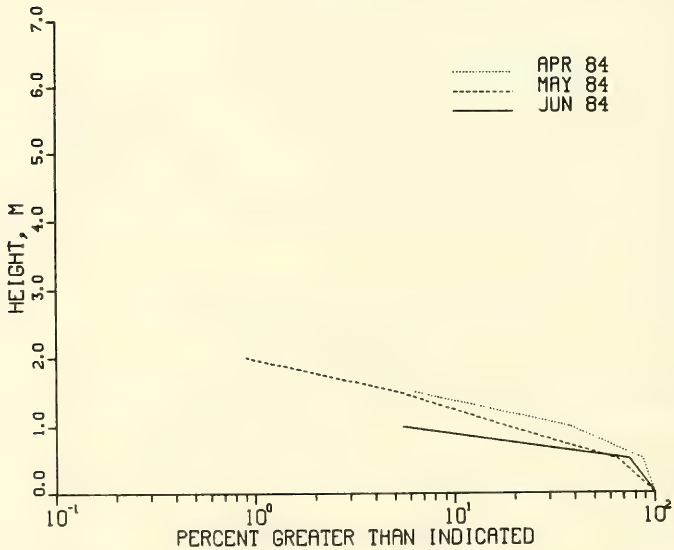
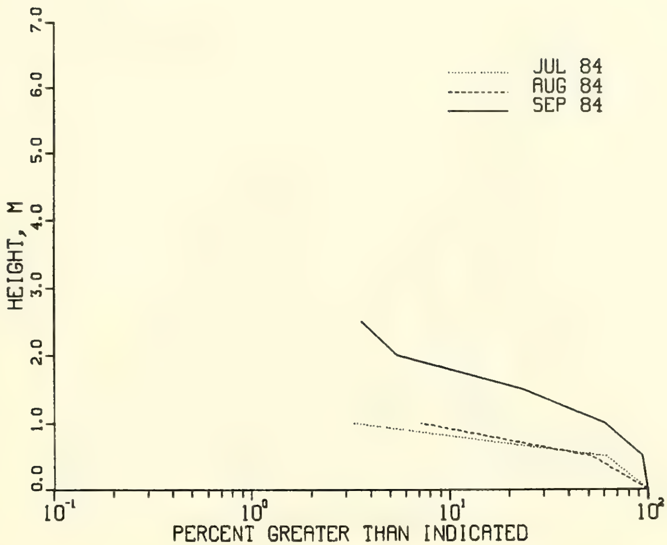


Figure B5. 1984 monthly cumulative distribution of H_{m_o} for gage 625 (Continued)



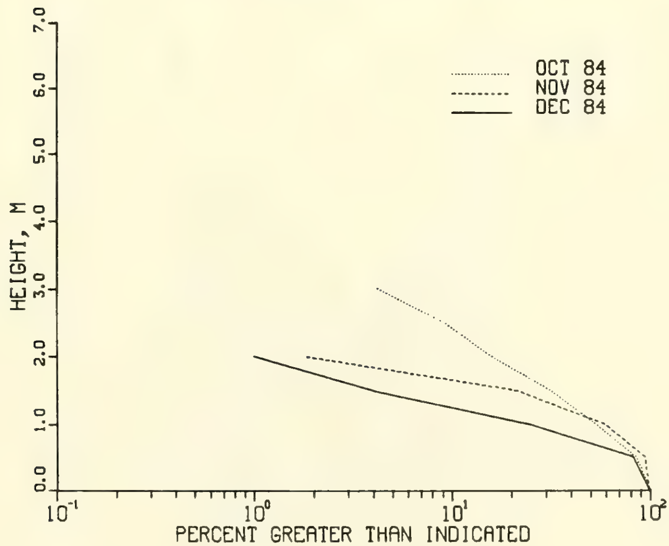


Figure B5. (Concluded)

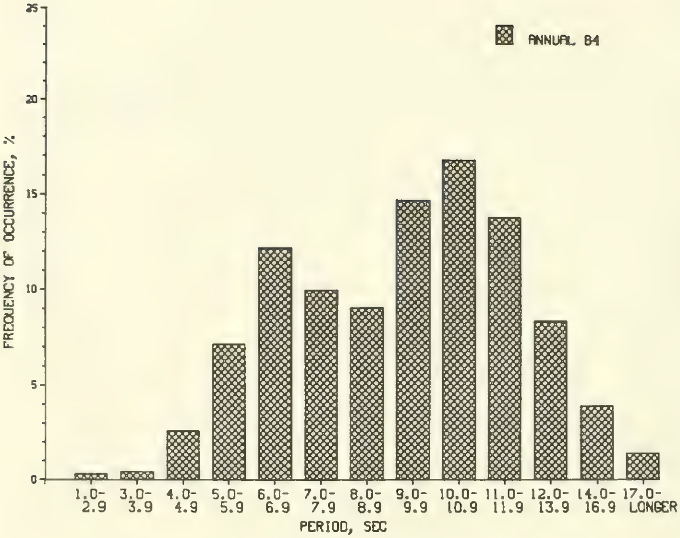


Figure B6. 1984 annual distribution of T_p for gage 625

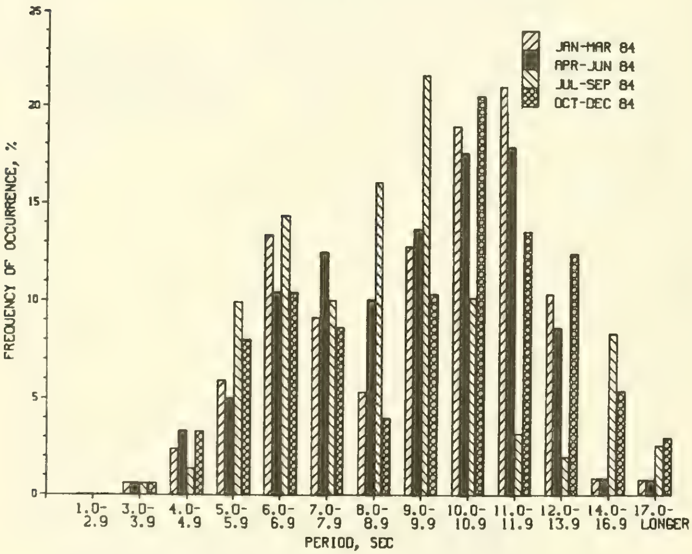
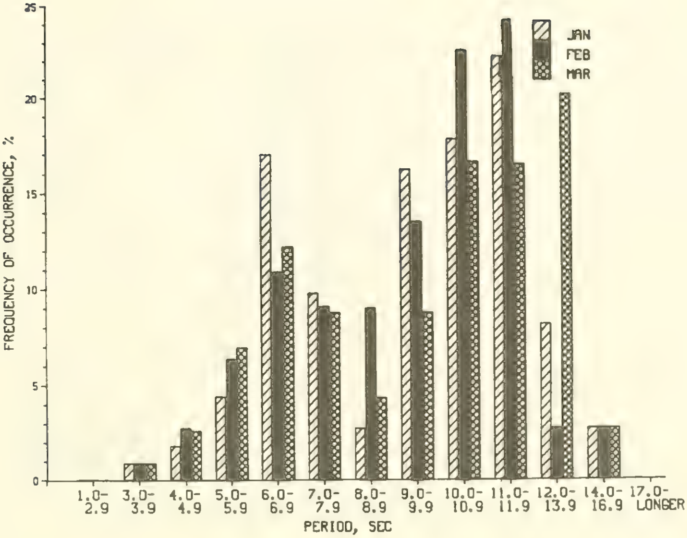


Figure B7. 1984 seasonal distribution of T_p for gage 625



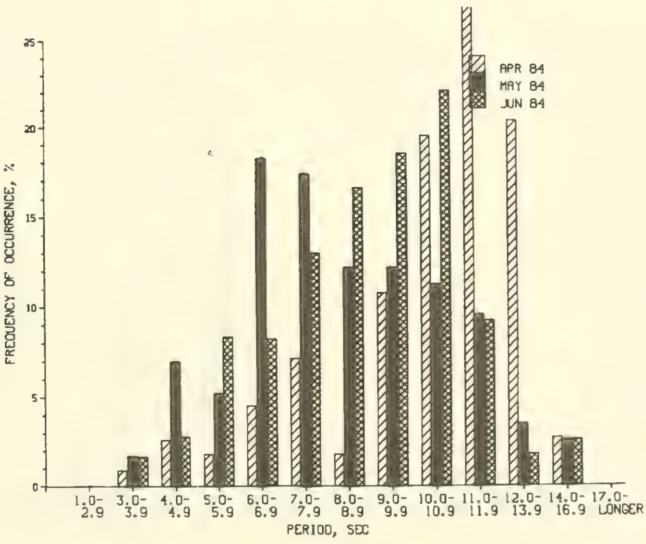
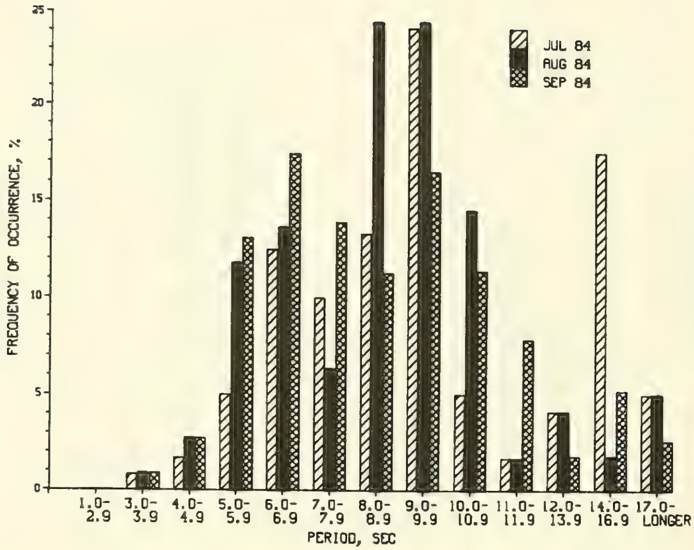


Figure B8. 1984 monthly distribution of T_p for gage 625 (Continued)



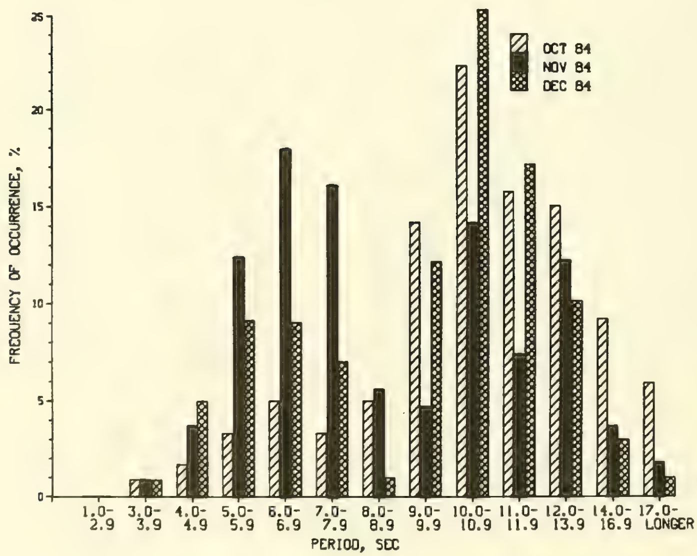


Figure B8. (Concluded)

Table B6

1984 Persistence of H_{m_0} for Gage 625

Height m	Consecutive Day(s) or Longer																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	32	45	62
0.5	22	20	18		17	16	15	14	13	11			10		9		8		6	5			4			3	2	1
1.0	49	34	23	15	11	7	6					3				1												
1.5	30	20	7		5	2				1																		
2.0	14	5			2																							
2.5	4	3		1																								
3.0		1																										
3.5																												
4.0																												

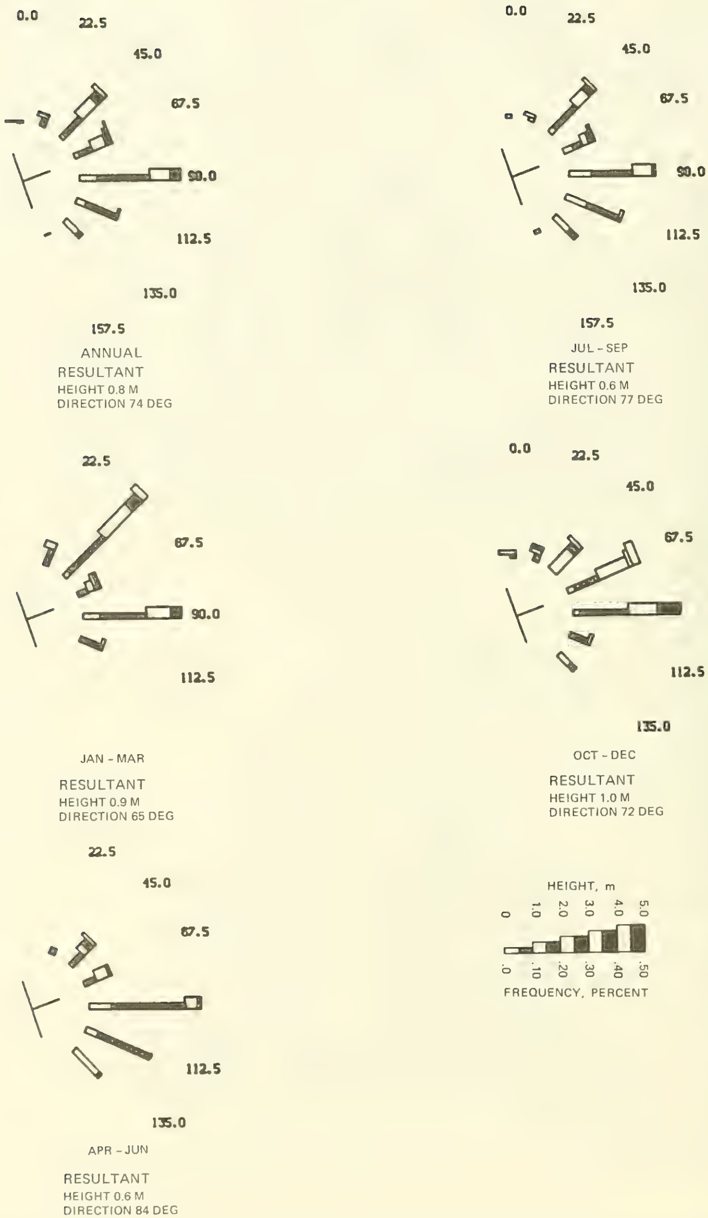
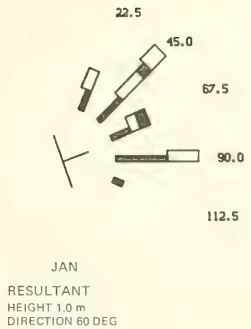
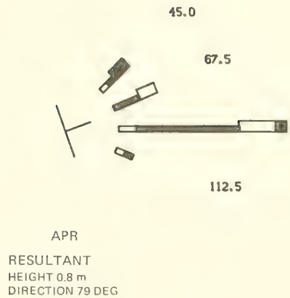
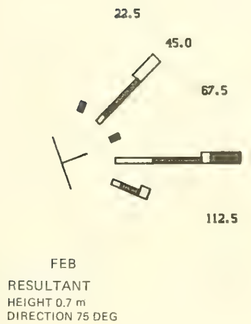
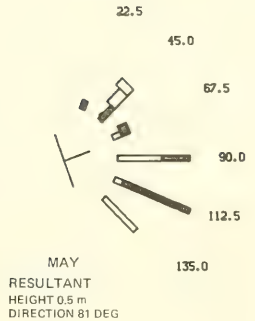


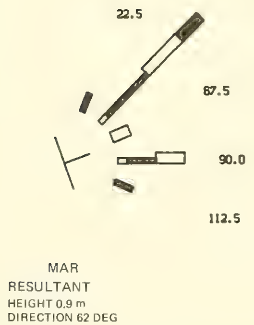
Figure B9. 1984 annual and seasonal visual wave observation roses











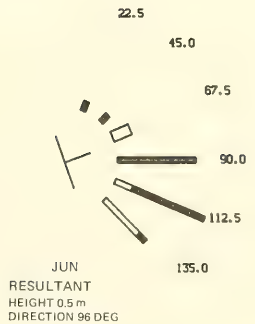


Figure B10. 1984 monthly visual wave observation roses (Continued)

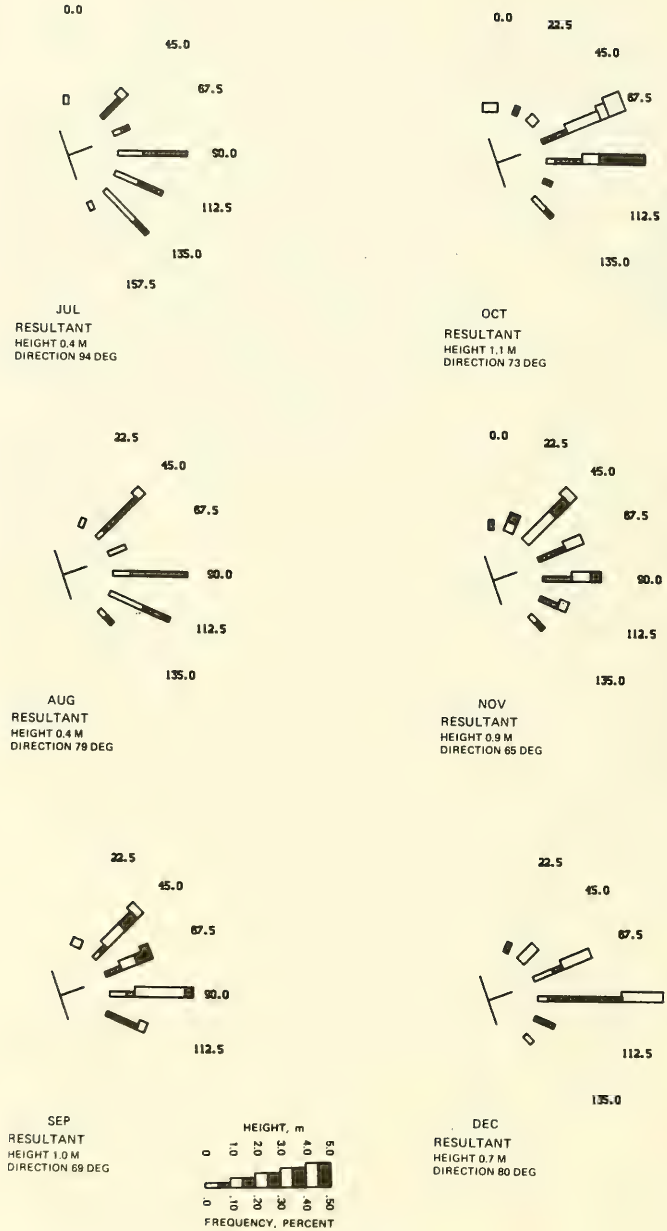
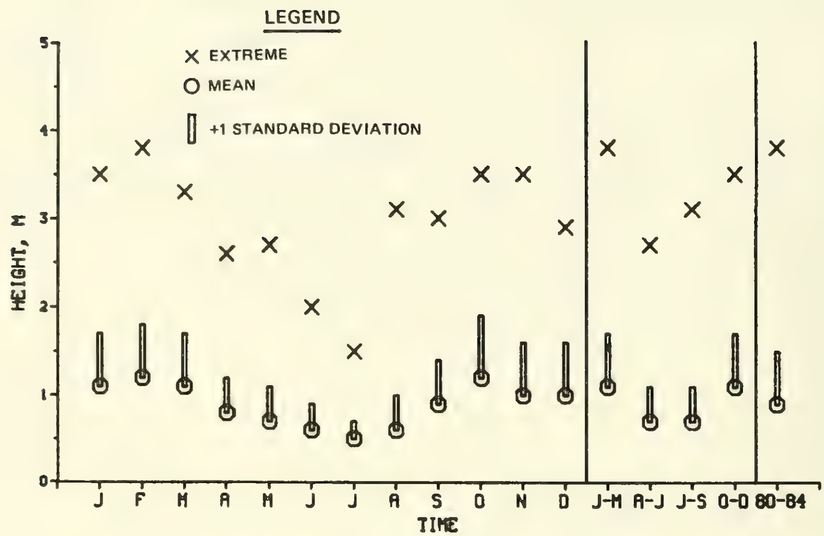


Figure B10. (Concluded)

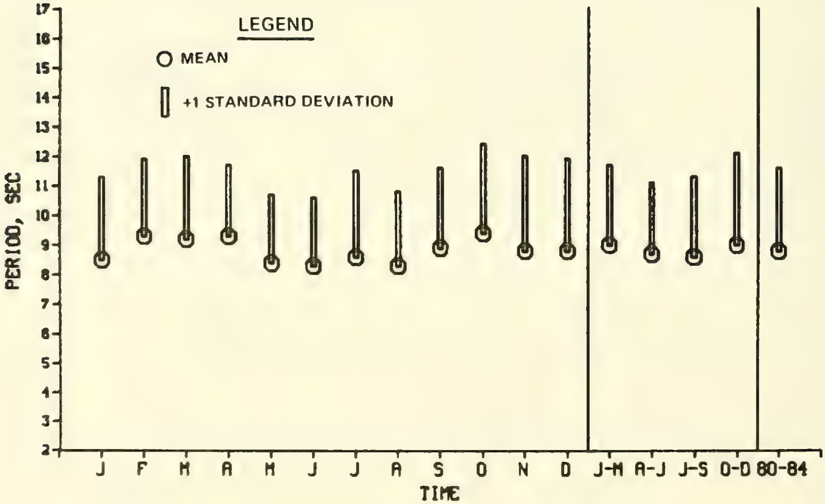
Table B7

1980 Through 1984 Mean, Standard Deviation, and Extreme H_{m_o} and T_p for Gage 625

Month	Mean Height, m	Standard Deviation Height, m	Mean Period sec	Standard Deviation Period sec	Extreme Height, m	Date	Number Observations
Jan	1.1	0.6	8.5	2.8	3.5	28	465
Feb	1.2	0.6	9.3	2.6	3.8	14	482
Mar	1.1	0.6	9.2	2.8	3.3	18	531
Apr	0.8	0.4	9.3	2.4	2.6	1	467
May	0.7	0.4	8.4	2.3	2.7	4	562
Jun	0.6	0.3	8.3	2.3	2.0	9	488
Jul	0.5	0.2	8.6	2.9	1.5	28	413
Aug	0.6	0.4	8.3	2.5	3.1	20	498
Sep	0.9	0.5	8.9	2.7	3.0	29	491
Oct	1.2	0.7	9.4	3.0	3.5	24	585
Nov	1.0	0.6	8.8	3.2	3.5	13	546
Dec	1.0	0.6	8.8	3.1	2.9	12	494
Jan-Mar	1.1	0.6	9.0	2.7	3.8	Feb	1,478
Apr-Jun	0.7	0.4	8.7	2.4	2.7	May	1,517
Jul-Sep	0.7	0.4	8.6	2.7	3.1	Aug	1,402
Oct-Dec	1.1	0.6	9.0	3.1	3.5	Oct	1,625
Annual	0.9	0.6	8.8	2.8	3.8	Feb	6,022



a. Height



b. Period

Figure B11. 1980 through 1984 mean, standard deviation, and extreme H_{m_o} and T_p for gage 625

Table B8

1980 Through 1984 Annual Joint Distribution of

H_{m_o} Versus T_p for Gage 625

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	1	2	4	9	19	24	36	29	13	20	18	2	177
.50 - .99	.	5	26	36	52	45	51	74	71	46	31	22	5	464
1.00 - 1.49	.	.	5	25	42	29	15	17	28	21	21	5	.	208
1.50 - 1.99	.	.	.	5	19	15	5	6	8	8	12	6	1	85
2.00 - 2.49	.	.	.	.	3	5	3	4	4	5	7	6	.	37
2.50 - 2.99	.	.	.	.	.	2	2	2	2	2	5	3	.	18
3.00 - 3.49	.	.	.	.	.	.	.	.	1	1	1	1	.	4
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	6	33	70	125	115	100	139	143	96	97	61	8	

Table B9

1980 Through 1984 Seasonal Joint Distribution of

H_{m_o} Versus T_p for Gage 625

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	1	1	3	5	5	6	9	14	11	12	5	.	72
.50 - .99	.	8	21	37	42	32	37	49	67	61	41	16	1	412
1.00 - 1.49	.	.	7	29	48	34	16	20	49	30	39	5	.	277
1.50 - 1.99	.	.	.	6	22	22	7	12	16	14	20	9	1	129
2.00 - 2.49	.	.	.	.	3	9	4	5	6	9	15	12	.	63
2.50 - 2.99	.	.	.	.	1	1	3	2	6	5	7	9	.	34
3.00 - 3.49	.	.	.	.	.	.	1	1	2	3	1	1	.	9
3.50 - 3.99	.	.	.	.	.	.	.	.	.	1	1	.	.	2
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	29	75	121	103	74	98	160	134	136	57	2	

(Continued)

Table B9 (Concluded)

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	1	3	4	18	26	45	43	31	15	16	13	1	216
.50 - .99	.	7	28	32	42	57	88	123	94	49	24	18	3	565
1.00 - 1.49	.	.	3	14	22	25	19	18	25	22	15	1	.	164
1.50 - 1.99	.	.	.	3	8	5	4	5	3	7	9	.	.	44
2.00 - 2.49	.	.	.	.	1	1	1	1	1	3	1	1	1	11
2.50 - 2.99	.	.	.	.	.	1	.	.	1	.	.	.	.	2
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	8	34	53	91	115	157	190	155	96	65	33	5	

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	3	2	4	12	37	41	83	57	11	22	36	6	314
.50 - .99	.	6	26	38	76	63	51	73	59	23	19	25	7	466
1.00 - 1.49	.	.	1	24	37	21	16	16	17	7	7	4	.	150
1.50 - 1.99	.	.	.	6	11	9	4	4	4	1	4	2	.	45
2.00 - 2.49	.	.	.	.	1	1	1	1	1	1	5	1	.	12
2.50 - 2.99	.	.	.	.	.	1	1	2	1	2	2	.	.	9
3.00 - 3.49	.	.	.	.	.	.	.	1	.	1	.	.	.	2
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	29	72	137	132	114	180	139	46	59	68	13	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	1	2	4	2	10	7	13	15	17	28	19	2	120
.50 - .99	.	2	28	38	50	31	28	51	64	49	39	29	10	419
1.00 - 1.49	.	.	9	34	57	34	9	15	23	22	23	8	2	236
1.50 - 1.99	.	.	1	5	35	22	4	4	9	10	14	12	3	119
2.00 - 2.49	.	.	.	.	7	7	6	9	6	7	9	9	1	61
2.50 - 2.99	.	.	.	.	1	4	4	3	2	1	9	3	1	28
3.00 - 3.49	.	.	.	.	.	.	1	1	1	1	4	3	.	11
3.50 - 3.99	.	.	.	.	.	.	.	.	1	.	1	1	.	3
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	3	40	81	152	108	59	96	121	107	127	84	19	

Table B10

1980 Through 1984 Monthly Joint Distribution

of H_{m_0} Versus T_p for Gage 625

MONTH JAN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	4	2	4	9	4	11	11	22	4	9	4	.	84
.50 - .99	.	15	30	45	43	24	24	37	45	60	45	24	2	394
1.00 - 1.49	.	.	4	49	77	30	15	17	39	26	13	.	.	270
1.50 - 1.99	.	.	.	4	22	39	6	17	13	17	6	4	.	128
2.00 - 2.49	.	.	.	.	4	19	2	9	13	13	17	11	.	88
2.50 - 2.99	.	.	.	.	2	2	2	4	6	.	6	6	.	28
3.00 - 3.49	.	.	.	.	.	.	.	2	.	.	.	.	.	2
3.50 - 3.99	.	.	.	.	.	.	.	.	.	2	.	.	.	2
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	19	36	102	157	118	60	97	138	122	96	49	2	

MONTH FEB
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	2	4	6	2	4	6	15	8	6	.	53
.50 - .99	.	2	8	27	35	25	44	60	87	75	33	4	2	402
1.00 - 1.49	.	.	6	17	39	31	17	23	58	33	35	6	.	265
1.50 - 1.99	.	.	.	12	33	15	8	15	23	10	27	8	.	151
2.00 - 2.49	.	.	.	.	2	8	4	8	2	10	17	17	.	68
2.50 - 2.99	.	.	.	.	.	.	4	2	8	8	12	10	.	44
3.00 - 3.49	.	.	.	.	.	.	.	.	4	4	2	.	.	10
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	2	.	.	2
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	2	14	58	113	85	79	112	188	155	136	51	2	

MONTH MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	4	4	4	6	11	15	13	17	6	.	80
.50 - .99	.	8	24	38	47	47	43	49	68	49	45	19	.	437
1.00 - 1.49	.	.	9	23	30	40	15	21	49	32	64	9	.	292
1.50 - 1.99	.	.	.	2	13	13	6	4	13	15	24	13	2	105
2.00 - 2.49	.	.	.	.	4	2	6	.	4	6	11	9	.	42
2.50 - 2.99	.	.	.	.	.	2	4	.	4	8	4	9	.	31
3.00 - 3.49	.	.	.	.	.	.	4	.	2	4	2	4	.	16
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	8	33	67	98	108	84	85	155	127	167	69	2	

(Continued)

(Sheet 1 of 4)

Table B10 (Continued)

MONTH APR

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	2	2	2	11	11	19	26	28	17	30	15	.	163
.50 - .99	.	.	13	15	21	43	51	86	126	92	47	19	2	515
1.00 - 1.49	.	.	11	19	34	36	9	17	19	47	34	.	.	226
1.50 - 1.99	.	.	.	2	11	6	6	11	6	13	17	.	.	72
2.00 - 2.49	.	.	.	.	2	.	2	.	4	9	.	.	.	17
2.50 - 2.99	.	.	.	.	.	4	.	.	.	.	.	.	.	4
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	2	26	38	79	100	87	140	183	178	128	34	2	

MONTH MAY

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	2	2	14	25	46	48	25	16	12	11	.	201
.50 - .99	.	9	34	37	59	57	112	135	80	34	20	12	2	591
1.00 - 1.49	.	.	.	11	21	27	27	20	30	12	11	4	.	163
1.50 - 1.99		.	.	5	7	2	5	4	2	2	7	.	.	34
2.00 - 2.49	.	.	.	.	2	2	.	2	.	.	2	2	2	12
2.50 - 2.99	.	.	.	.	.	.	.	.	2	.	.	.	.	2
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	36	55	103	113	190	209	139	64	52	29	4	

MONTH JUN

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	2	4	8	31	41	68	53	41	12	8	12	2	282
.50 - .99	.	10	35	43	41	70	96	143	80	27	6	23	4	578
1.00 - 1.49	.	.	.	12	12	12	20	16	25	10	2	.	.	109
1.50 - 1.99	.	.	.	2	6	6	.	.	2	6	4	.	.	26
2.00 - 2.49	.	.	.	.	.	2	.	.	.	.	.	.	.	2
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	12	39	65	90	131	184	212	148	55	20	35	6	

(Continued)

(Sheet 2 of 4)

Table B10 (Continued)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	7	5	7	12	51	61	128	70	24	24	48	5	442
.50 - .99	.	10	31	39	82	73	56	75	48	12	2	44	17	489
1.00 - 1.49	.	.	5	17	24	12	7	.	.	.	.	.	.	65
1.50 - 1.99	.	.	.	.	.	2	.	.	.	.	.	.	.	2
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	17	41	63	118	138	124	203	118	36	26	92	22	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	2	2	4	24	56	56	100	82	2	24	38	2	392
.50 - .99	.	6	22	48	80	80	64	72	40	16	16	12	6	462
1.00 - 1.49	.	.	.	20	28	20	14	2	.	4	.	.	.	88
1.50 - 1.99	.	.	.	4	8	6	2	.	2	.	4	2	.	28
2.00 - 2.49	.	.	.	.	2	.	.	.	.	4	10	.	.	16
2.50 - 2.99	.	.	.	.	.	.	2	2	2	.	.	.	.	6
3.00 - 3.49	.	.	.	.	.	.	.	2	.	2	.	.	.	4
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	8	24	76	142	162	138	178	126	28	54	52	8	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	6	10	29	20	8	18	24	10	125
.50 - .99	.	2	24	26	65	37	35	73	88	39	35	22	.	446
1.00 - 1.49	.	.	.	33	57	31	26	43	49	16	20	10	.	285
1.50 - 1.99	.	.	.	12	22	18	8	12	10	4	6	4	.	96
2.00 - 2.49	.	.	.	.	.	4	2	4	2	.	4	4	.	20
2.50 - 2.99	.	.	.	.	.	2	2	4	2	6	6	.	.	22
3.00 - 3.49	.	.	.	.	.	.	.	.	.	2	.	.	.	2
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	2	24	71	144	98	83	165	171	75	89	64	10	

(Continued)

(Sheet 3 of 4)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	5	10	15	9	22	14	7	3	85
.50 - .99	.	2	19	24	36	21	26	50	89	51	34	32	7	391
1.00 - 1.49	.	.	7	36	44	29	5	15	27	31	32	10	3	239
1.50 - 1.99	.	.	3	7	31	12	5	5	14	14	27	12	5	135
2.00 - 2.49	.	.	.	.	12	10	10	15	10	5	9	12	2	85
2.50 - 2.99	.	.	.	.	3	5	7	2	3	2	14	3	3	42
3.00 - 3.49	.	.	.	.	.	.	2	.	.	.	7	7	.	16
3.50 - 3.99	.	.	.	.	.	.	.	.	3	.	.	2	.	5
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	2	29	67	126	82	65	102	155	125	137	85	23	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	5	11	2	16	7	15	15	11	42	24	.	148
.50 - .99	.	4	38	42	64	48	37	44	29	44	46	27	5	428
1.00 - 1.49	.	.	11	22	73	38	11	15	20	18	18	11	2	239
1.50 - 1.99	.	.	.	4	31	24	4	2	5	4	7	20	4	105
2.00 - 2.49	.	.	.	.	4	4	5	.	2	4	13	11	.	43
2.50 - 2.99	.	.	.	.	.	2	4	2	.	.	7	5	.	20
3.00 - 3.49	.	.	.	.	.	.	.	2	4	2	4	2	.	14
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	4	.	.	4
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	4	54	79	174	132	68	80	75	83	141	100	11	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	2	2	2	4	8	2	8	24	16	30	28	4	130
.50 - .99	.	.	26	51	53	26	20	61	73	53	38	26	20	447
1.00 - 1.49	.	.	10	47	55	36	12	16	20	16	16	2	.	230
1.50 - 1.99	.	.	.	4	45	32	4	4	8	12	4	2	.	115
2.00 - 2.49	.	.	.	.	6	6	2	12	6	12	6	4	.	54
2.50 - 2.99	.	.	.	.	.	4	.	6	2	2	6	.	.	20
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	2	38	104	163	112	40	107	133	111	100	62	24	

(Sheet 4 of 4)

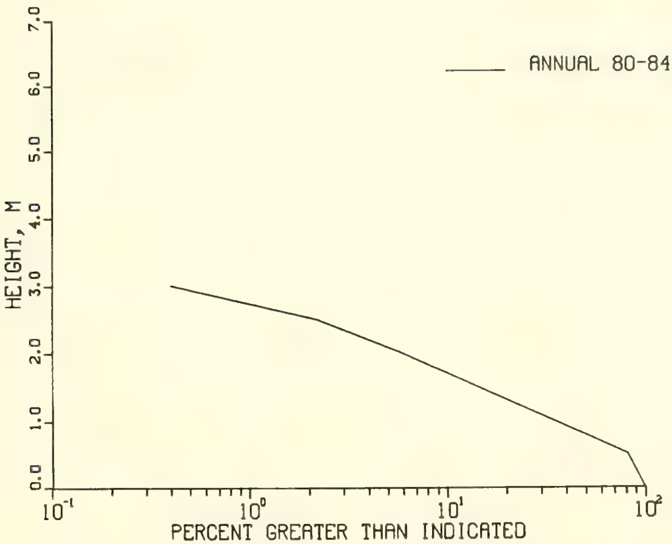


Figure B12. 1980 through 1984 annual cumulative distribution of H_{m_o} for gage 625

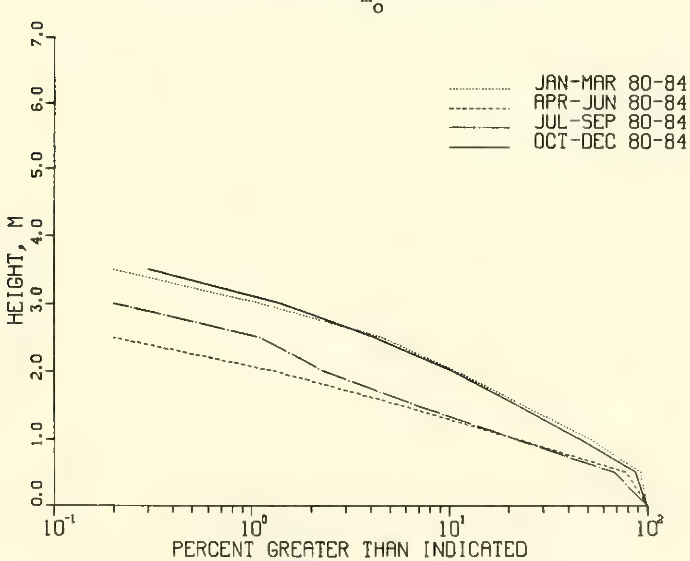
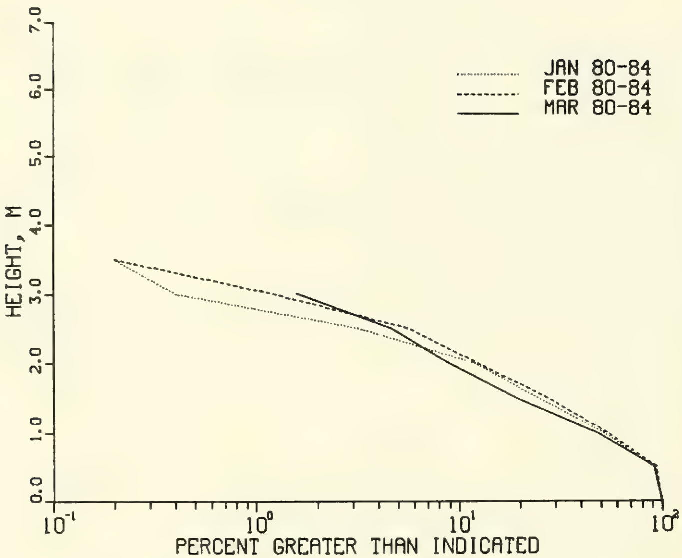


Figure B13. 1980 through 1984 seasonal cumulative distribution of H_{m_o} for gage 625



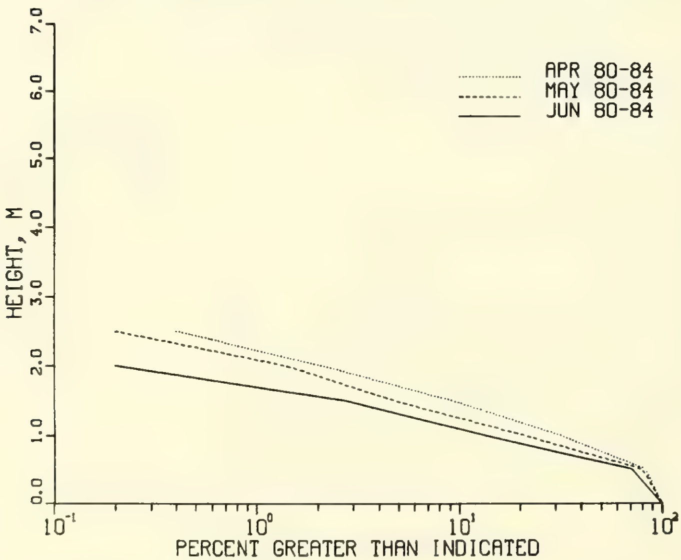
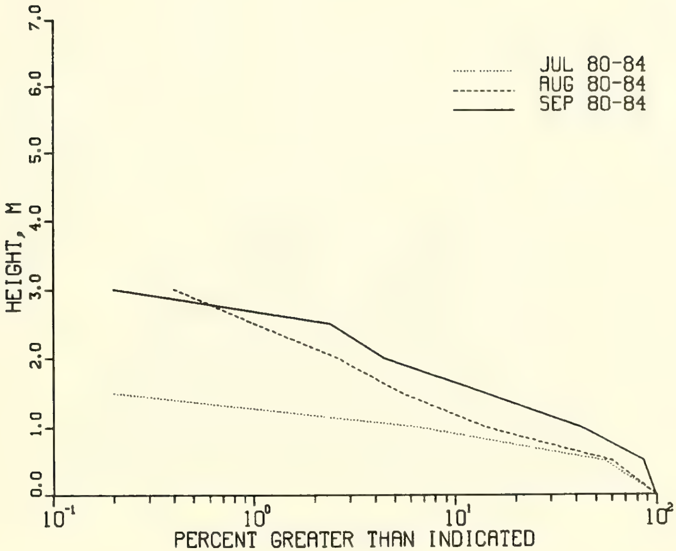


Figure B14. 1980 through 1984 monthly cumulative distribution of H_{m_0} for gage 625 (Continued)



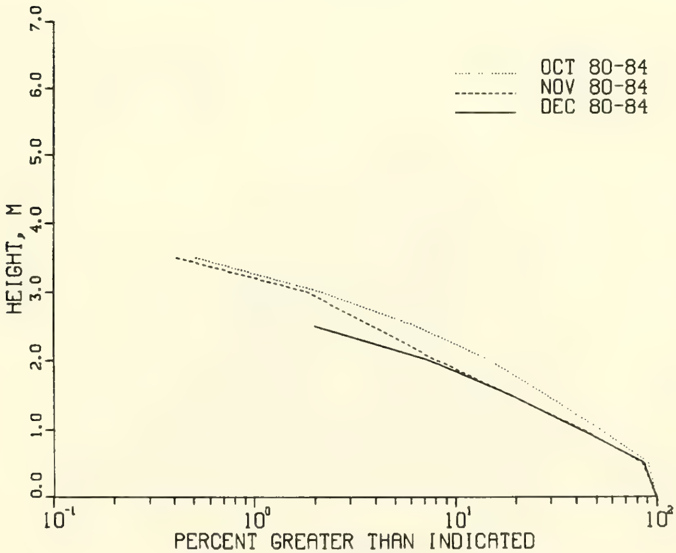


Figure B14. (Concluded)

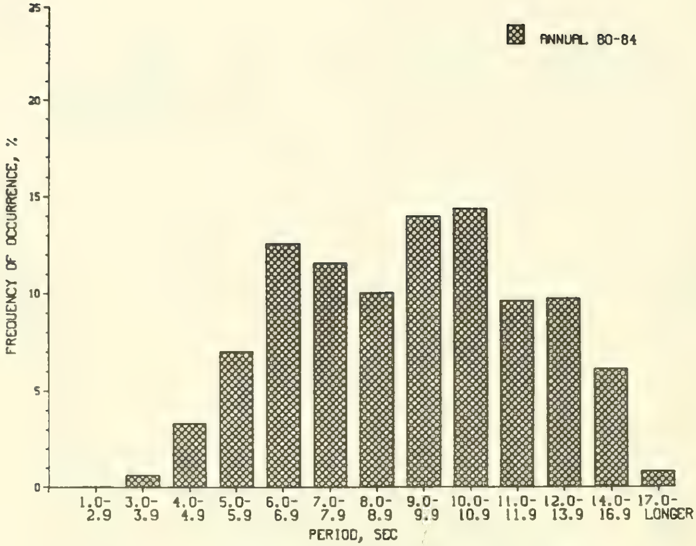


Figure B15. 1980 through 1984 annual distribution of T_p for gage 625

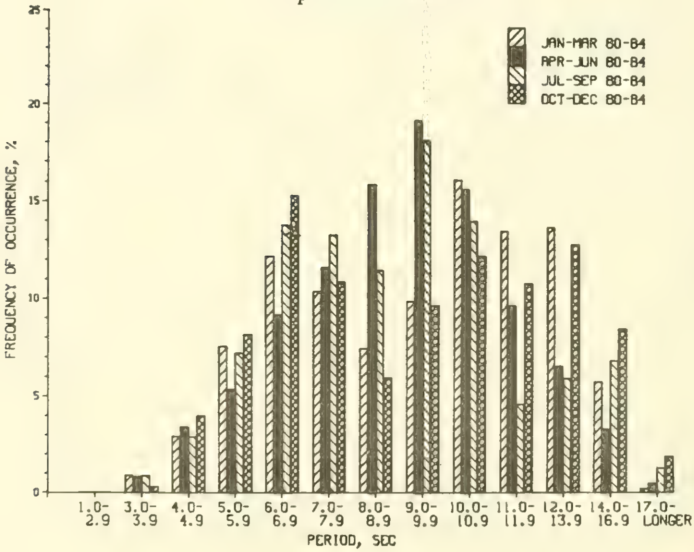
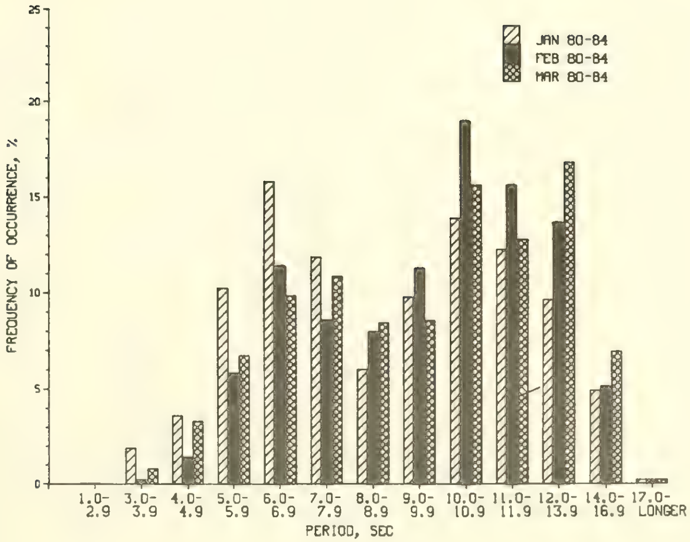


Figure B16. 1980 through 1984 seasonal distribution of T_p for gage 625



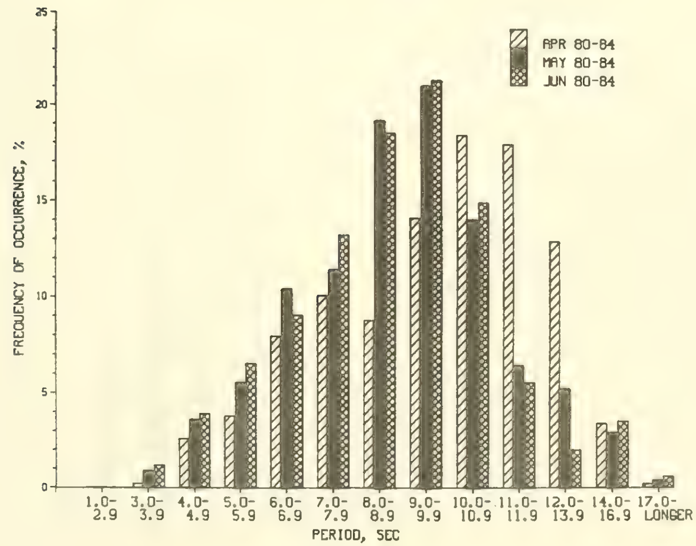
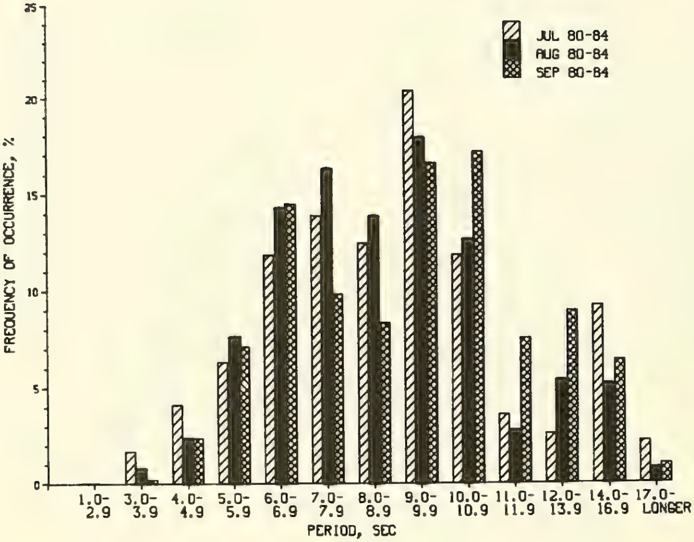


Figure B17. 1980 through 1984 monthly distribution of T_p for gage 625 (Continued)



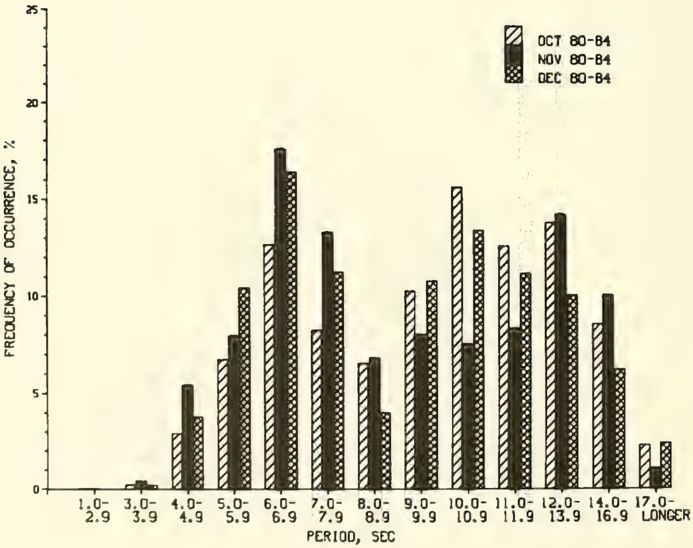


Figure B17. (Concluded)

Table B11

1980 Through 1984 Persistence of H_{m_o} for Gage 625

Height	Consecutive Day(s) or Longer																									
m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	34
0.5	27	23	21	17		14	12	11	9			8			7	6			4							3
1.0	46	32	23	16	11	9		6	4		2															
1.5	31	18	10	7	5	3																				
2.0	17	9	6	3																						
2.5	10	5	2	1																						
3.0	3	1																								
3.5	2	1																								
4.0																										

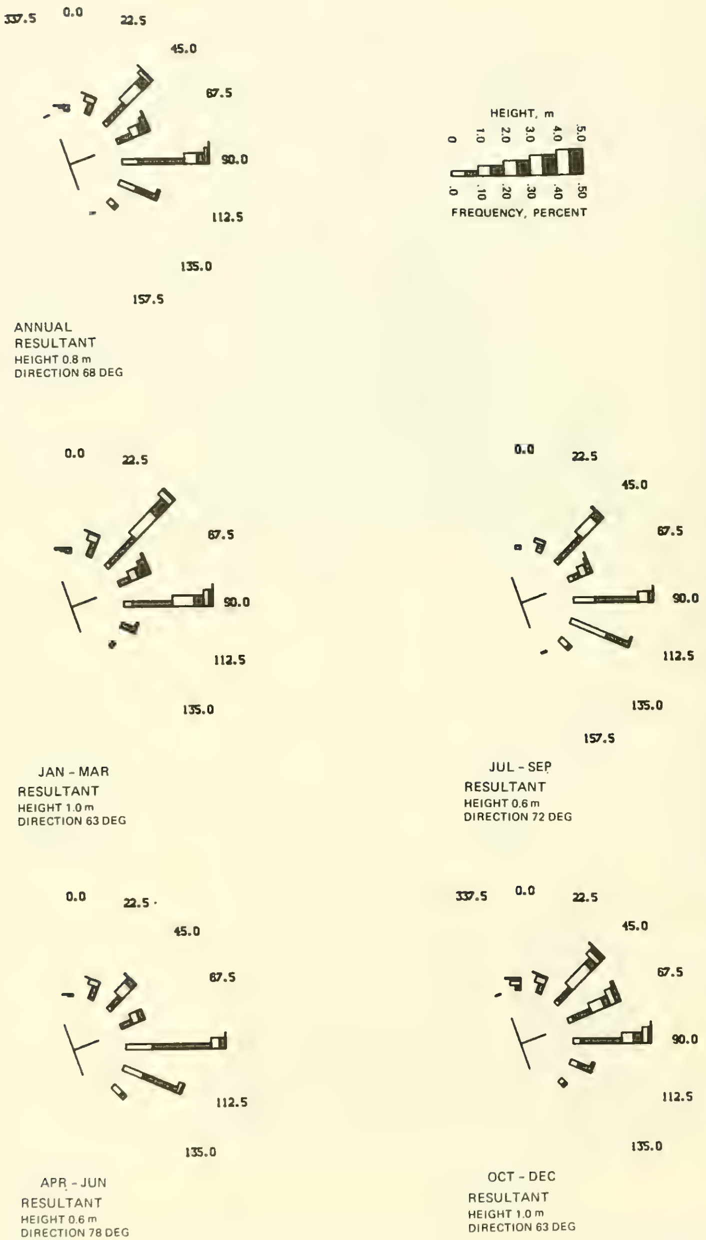
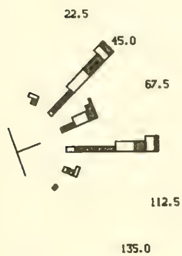


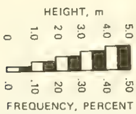
Figure B18. 1980 through 1984 annual and seasonal visual wave observation roses

JAN
RESULTANT
HEIGHT 1.0 m
DIRECTION 55 DEG



FEB
RESULTANT
HEIGHT 1.0 m
DIRECTION 66 DEG

MAR
RESULTANT
HEIGHT 0.9 m
DIRECTION 67 DEG



APR
RESULTANT
HEIGHT 0.7 m
DIRECTION 72 DEG

MAY
RESULTANT
HEIGHT 0.7 m
DIRECTION 78 DEG

JUN
RESULTANT
HEIGHT 0.6 m
DIRECTION 84 DEG

Figure B19. 1980 through 1984 monthly visual wave observation roses (Continued)

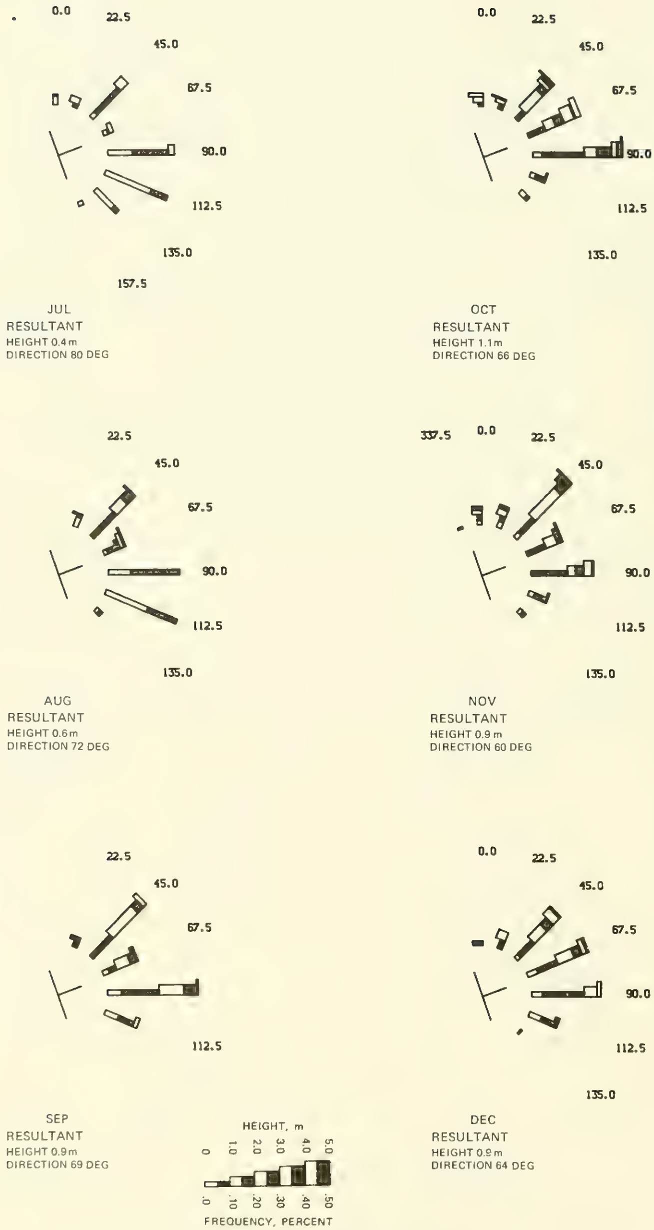
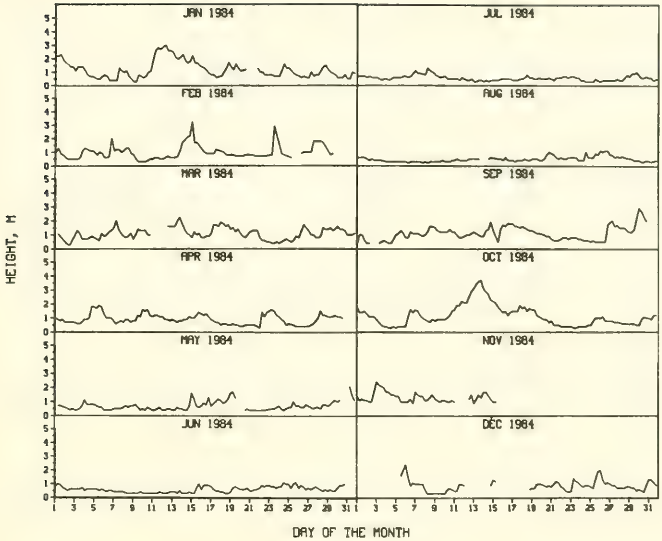
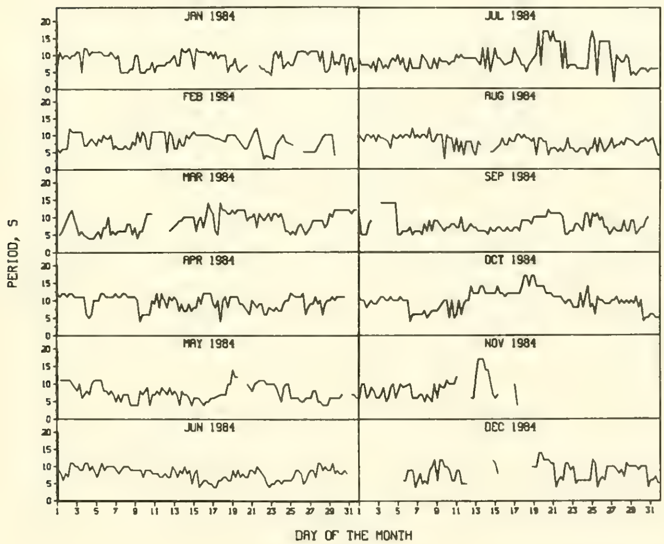


Figure B19. (Concluded)



a. Height



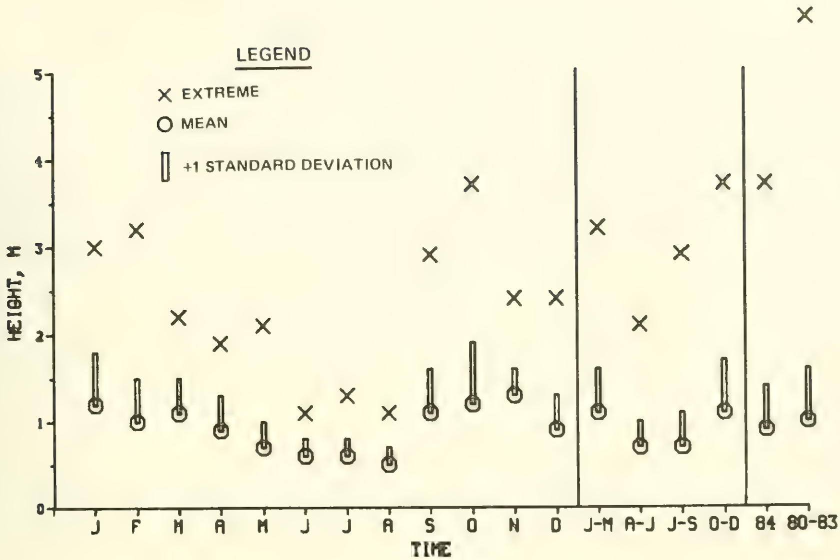
b. Period

Figure B20. Time-history of H_{m_o} and T_p for gage 620

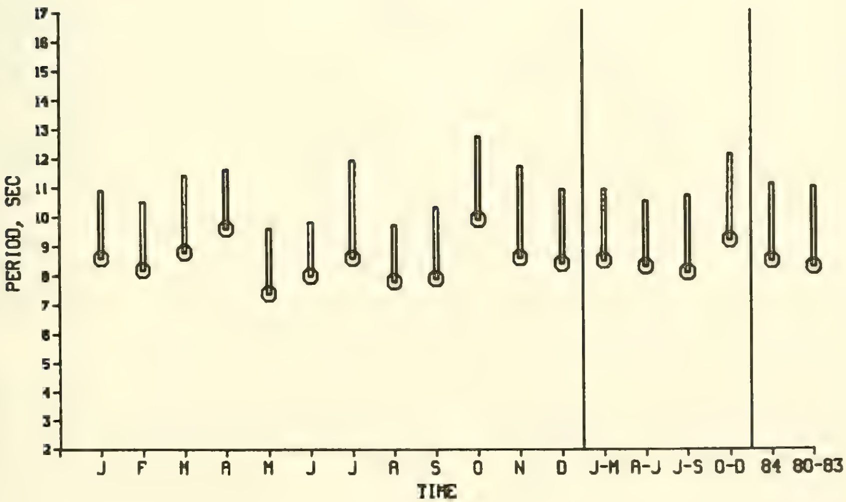
Table B12

1984 Mean, Standard Deviation, and Extreme H_{m_0} and T_p for Gage 620

Month	Mean Height, m	Standard Deviation Height, m	Mean Period sec	Standard Deviation Period sec	Extreme Height, m	Date	Number Observations
Jan	1.2	0.6	8.6	2.3	3.0	12	119
Feb	1.0	0.5	8.2	2.3	3.2	15	86
Mar	1.1	0.4	8.8	2.6	2.2	13	106
Apr	0.9	0.4	9.6	2.0	1.9	5	117
May	0.7	0.3	7.4	2.2	2.1	31	109
Jun	0.6	0.2	8.0	1.8	1.1	24	117
Jul	0.6	0.2	8.6	3.3	1.3	8	119
Aug	0.5	0.2	7.8	1.9	1.1	26	114
Sep	1.1	0.5	7.9	2.4	2.9	30	116
Oct	1.2	0.7	9.9	2.8	3.7	13	123
Nov	1.3	0.3	8.6	3.1	2.4	3	52
Dec	0.9	0.4	8.4	2.5	2.4	6	84
Jan-Mar	1.1	0.5	8.5	2.4	3.2	Feb	311
Apr-Jun	0.7	0.3	8.3	2.2	2.1	May	343
Jul-Sep	0.7	0.4	8.1	2.6	2.9	Sep	349
Oct-Dec	1.1	0.6	9.2	2.9	3.7	Oct	259
Annual	0.9	0.5	8.5	2.6	3.7	Oct	1,262



a. Height



b. Period

Figure B21. 1984 mean, standard deviation, and extreme H_{m_0} and T_p for gage 620

Table B13

1984 Annual Joint Distribution of H_{m_o} Versus T_p

for Gage 620

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	1	1	2	2	13	15	32	38	40	10	10	10	1	175
.50 - .99	.	2	25	40	67	51	40	71	60	72	17	7	4	456
1.00 - 1.49	.	.	6	30	54	31	18	19	34	23	21	4	2	242
1.50 - 1.99	.	.	.	6	25	8	2	8	12	6	11	6	4	88
2.00 - 2.49	.	.	.	1	5	6	.	6	3	2	2	1	.	26
2.50 - 2.99	.	.	.	.	.	6	1	1	1	.	2	1	.	12
3.00 - 3.49	.	.	.	.	.	.	1	.	.	1	2	.	.	4
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	2	.	2
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	1	3	33	79	164	117	94	143	150	114	65	31	11	

Table B14

1984 Seasonal Joint Distribution of H_{m_o}

Versus T_p for Gage 620

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	.	.	6	.	3	3	16	19	3	.	.	50
.50 - .99	.	6	23	35	55	26	23	61	74	100	13	3	.	419
1.00 - 1.49	.	.	3	51	61	45	23	19	39	48	45	.	.	334
1.50 - 1.99	.	.	.	19	10	13	3	6	29	19	16	3	.	118
2.00 - 2.49	.	.	.	.	10	10	.	13	3	6	3	.	.	45
2.50 - 2.99	.	.	.	.	.	16	3	3	3	.	.	.	.	25
3.00 - 3.49	.	.	.	.	.	.	3	.	.	3	.	.	.	6
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	6	26	105	142	110	58	105	164	195	80	6	0	

(Continued)

Table B14 (Concluded)

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	3	12	44	47	52	35	15	3	.	.	211
.50 - .99	.	.	47	52	64	70	58	90	55	108	23	.	.	567
1.00 - 1.49	.	.	3	3	41	17	20	15	23	29	23	.	.	174
1.50 - 1.99	.	.	.	.	15	6	3	.	9	.	9	3	.	45
2.00 - 2.49	.	.	.	.	.	3	.	.	.	.	.	.	.	3
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	50	58	132	140	128	157	122	152	58	3	0	

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	3	3	6	6	29	11	57	74	54	.	17	32	3	295
.50 - .99	.	.	17	49	97	80	57	69	37	26	3	23	14	472
1.00 - 1.49	.	.	3	29	49	32	14	14	14	.	.	.	.	155
1.50 - 1.99	.	.	.	3	32	9	.	17	.	.	.	.	.	61
2.00 - 2.49	.	.	.	.	3	3	.	3	3	.	.	.	.	12
2.50 - 2.99	.	.	.	.	.	6	.	.	.	.	.	.	.	6
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	3	26	87	210	141	128	177	108	26	20	55	17	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	4	.	15	12	58	8	15	4	.	116
.50 - .99	.	.	8	15	42	15	15	58	81	54	31	.	.	319
1.00 - 1.49	.	.	19	42	69	31	15	31	69	15	15	19	8	333
1.50 - 1.99	.	.	.	4	46	4	4	8	12	4	23	19	19	143
2.00 - 2.49	.	.	.	4	8	8	.	12	8	.	8	4	.	52
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	12	4	.	16
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	12	.	.	12
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	8	.	8
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	27	65	169	58	49	121	228	81	116	58	27	

Table B15

1984 Monthly Joint Distribution of H_{m_o} Versus T_p for Gage 620

MONTH JAN

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	.	8	34	8	.	.	.	50
.50 - .99	.	.	17	42	34	17	17	50	84	134	.	.	.	395
1.00 - 1.49	.	.	.	76	50	42	17	8	34	59	17	.	.	303
1.50 - 1.99	.	.	.	17	8	17	.	8	25	25	17	.	.	117
2.00 - 2.49	.	.	.	.	8	25	.	8	.	17	8	.	.	66
2.50 - 2.99	.	.	.	.	.	34	8	8	8	.	.	.	.	58
3.00 - 3.49	.	.	.	.	.	.	8	.	.	.	.	.	.	8
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	17	135	100	135	50	90	185	243	42	0	0	

MONTH FEB

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	23	.	12	.	12	12	.	.	.	59
.50 - .99	.	23	23	23	81	23	23	70	93	163	23	.	.	545
1.00 - 1.49	.	.	.	35	70	70	47	23	12	.	.	.	.	257
1.50 - 1.99	.	.	.	12	.	12	.	12	47	.	.	.	.	83
2.00 - 2.49	.	.	.	.	12	.	.	12	12	.	.	.	.	36
2.50 - 2.99	.	.	.	.	.	12	.	.	.	.	.	.	.	12
3.00 - 3.49	.	.	.	.	.	.	.	.	.	12	.	.	.	12
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	23	23	70	186	117	82	117	176	187	23	0	0	

MONTH MAR

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	.	.	.	38	9	.	.	47
.50 - .99	.	.	28	38	57	38	28	66	47	9	19	9	.	339
1.00 - 1.49	.	.	9	38	66	28	9	28	66	75	113	.	.	432
1.50 - 1.99	.	.	.	28	19	9	9	.	19	28	28	9	.	149
2.00 - 2.49	.	.	.	.	9	.	.	19	.	.	.	.	.	28
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	37	104	151	75	46	113	132	150	169	18	0	

(Continued)

(Sheet 1 of 4)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	.	.	9	.	17	34	.	17	9	.	.	86
.50 - .99	.	.	9	9	17	34	34	68	68	188	68	.	.	495
1.00 - 1.49	.	.	9	.	34	26	34	26	51	85	60	.	.	325
1.50 - 1.99	.	.	.	.	34	9	9	.	26	.	17	.	.	95
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	18	9	94	69	94	128	145	290	154	0	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	.	.	9	64	64	9	55	28	.	.	.	229
.50 - .99	.	.	101	92	101	101	55	55	28	64	.	.	.	597
1.00 - 1.49	.	.	.	.	64	28	9	.	18	.	9	.	.	128
1.50 - 1.99	.	.	.	.	9	9	.	.	.	.	9	9	.	36
2.00 - 2.49	.	.	.	.	.	9	.	.	.	.	.	.	.	9
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	101	92	183	211	128	64	101	92	18	9	0	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	.	9	17	68	60	111	51	.	.	.	.	316
.50 - .99	.	.	34	60	77	77	85	145	68	68	.	.	.	614
1.00 - 1.49	.	.	.	9	26	.	17	17	.	.	.	.	.	69
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	34	78	120	145	162	273	119	68	0	0	0	

(Continued)

(Sheet 2 of 4)

Table B15 (Continued)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

PERIOD(SECONDS)

HEIGHT(METERS)	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	8	.	.	8	50	8	42	50	25	.	34	67	8	300
.50 - .99	.	.	25	42	143	126	92	109	42	.	.	34	42	655
1.00 - 1.49	.	.	.	8	25	.	.	8	.	.	.	.	.	41
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	8	0	25	58	218	134	134	167	67	0	34	101	50	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

PERIOD(SECONDS)

HEIGHT(METERS)	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	9	18	9	35	26	123	167	132	.	18	.	.	537
.50 - .99	.	.	26	79	79	53	53	88	35	.	.	.	.	413
1.00 - 1.49	.	.	9	9	18	18	.	.	.	.	.	.	.	54
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	53	97	132	97	176	255	167	0	18	0	0	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

PERIOD(SECONDS)

HEIGHT(METERS)	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	9	9	9	.	.	26	.	53
.50 - .99	.	.	.	26	69	60	26	9	34	78	9	34	.	345
1.00 - 1.49	.	.	.	69	103	78	43	34	43	.	.	.	.	370
1.50 - 1.99	.	.	.	9	95	26	.	52	.	.	.	.	.	182
2.00 - 2.49	.	.	.	.	9	9	.	9	9	.	.	.	.	36
2.50 - 2.99	.	.	.	.	.	17	.	.	.	.	.	.	.	17
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	0	104	276	190	78	113	95	78	9	60	0	

(Continued)

(Sheet 3 of 4)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	33	8	89	16	8	8	.	162
.50 - .99	.	.	8	8	24	24	24	65	73	65	24	.	.	315
1.00 - 1.49	.	.	8	41	24	8	.	33	49	16	16	24	.	219
1.50 - 1.99	.	.	.	8	41	.	8	.	8	8	49	24	33	179
2.00 - 2.49	.	.	.	.	.	.	.	8	16	.	16	8	.	48
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	24	8	.	32
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	24	.	.	24
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	16	.	16
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	16	57	89	32	65	114	235	105	161	88	33	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
.50 - .99	.	.	.	.	19	.	.	.	.	.	19	.	.	38
1.00 - 1.49	.	.	19	38	135	96	38	77	173	19	19	.	38	652
1.50 - 1.99	.	.	.	.	96	19	.	19	38	.	.	38	19	229
2.00 - 2.49	.	.	.	19	19	19	.	19	.	.	.	.	.	76
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	19	57	269	134	38	115	211	19	38	38	57	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	12	.	.	24	48	.	36	.	.	120
.50 - .99	.	.	12	36	83	12	12	83	143	71	48	.	.	500
1.00 - 1.49	.	.	36	48	95	24	24	.	36	12	12	24	.	311
1.50 - 1.99	.	.	.	.	24	.	.	12	.	.	.	.	.	36
2.00 - 2.49	.	.	.	.	12	12	.	12	.	.	.	.	.	36
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	48	84	226	48	36	131	227	83	96	24	0	

(Sheet 4 of 4)

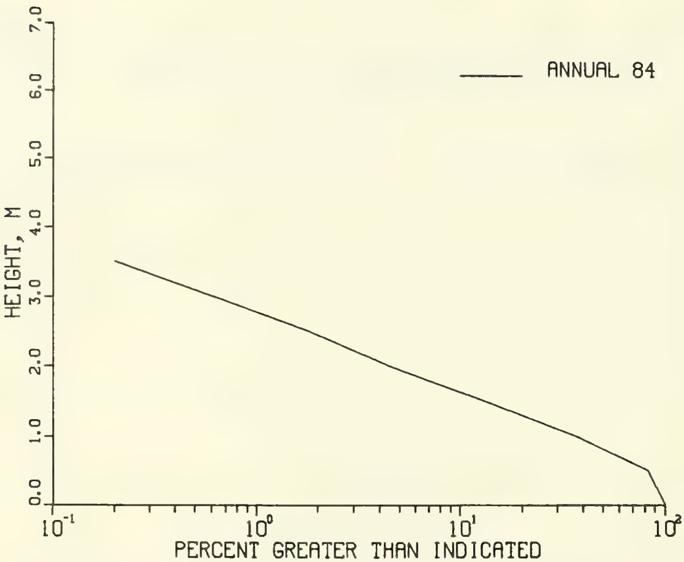


Figure B22. 1984 annual cumulative distribution of H_{m_o} for gage 620

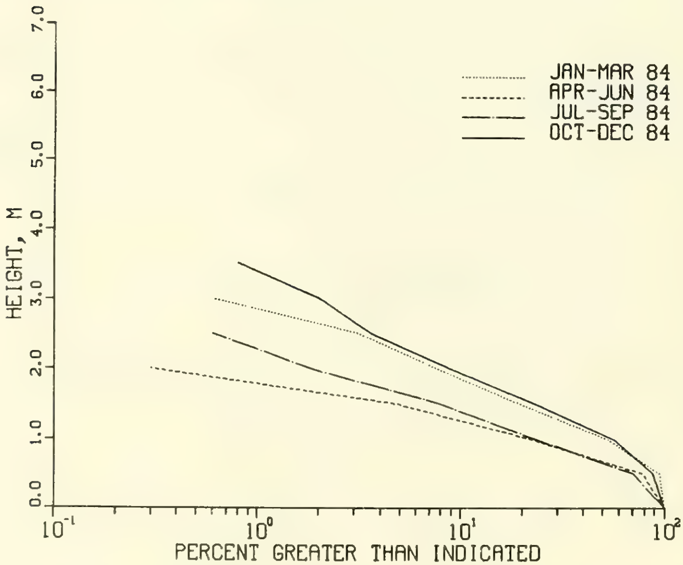
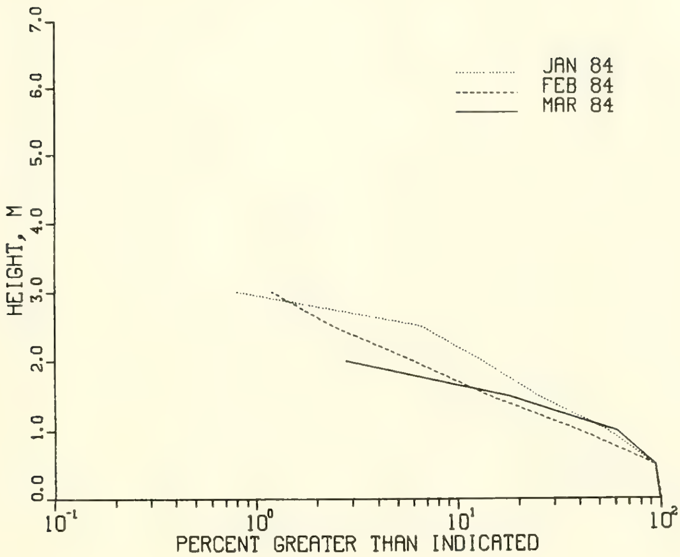


Figure B23. 1984 seasonal cumulative distribution of H_{m_o} for gage 620



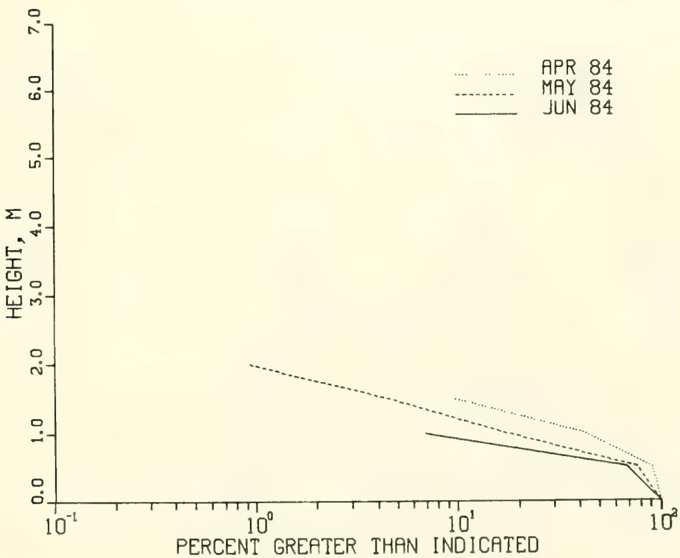


Figure B24. 1984 monthly cumulative distribution of H_{m_o} for gage 620 (Continued)

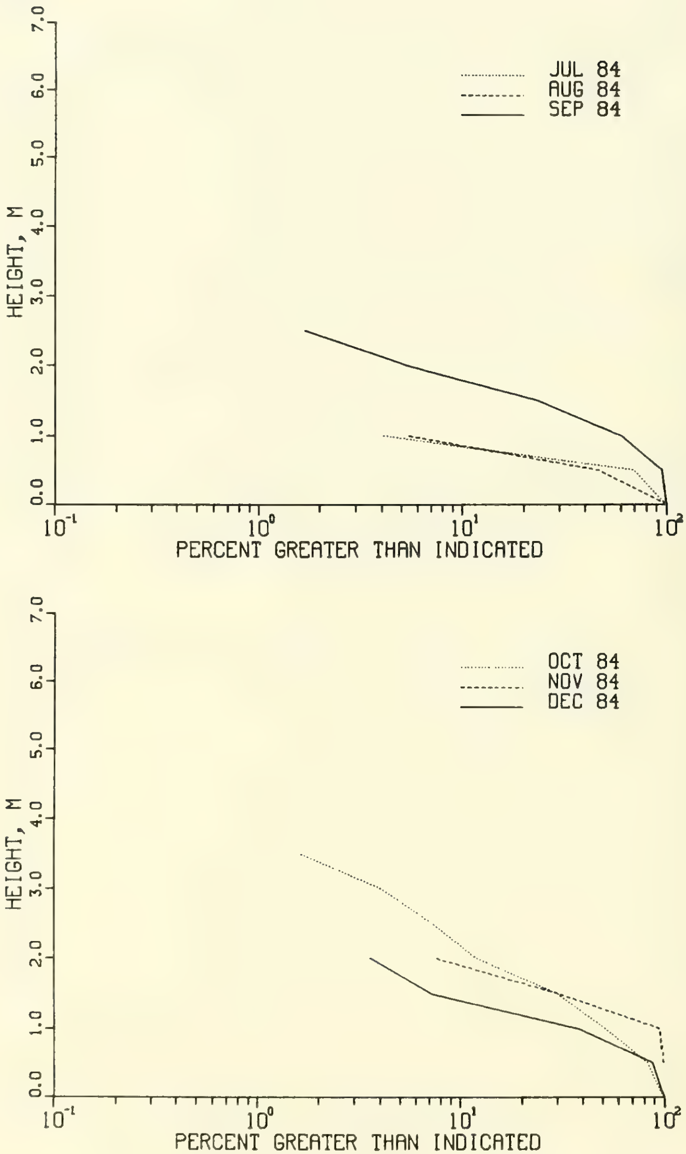


Figure B24. (Concluded)

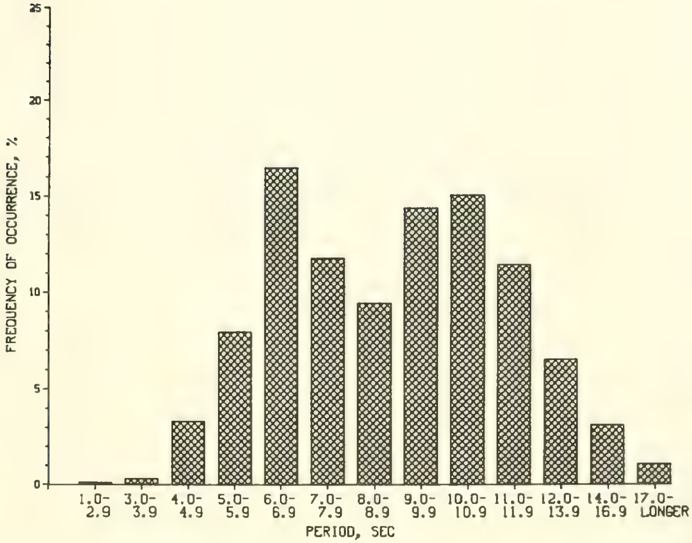


Figure B25. 1984 annual distribution of T_p for gage 620

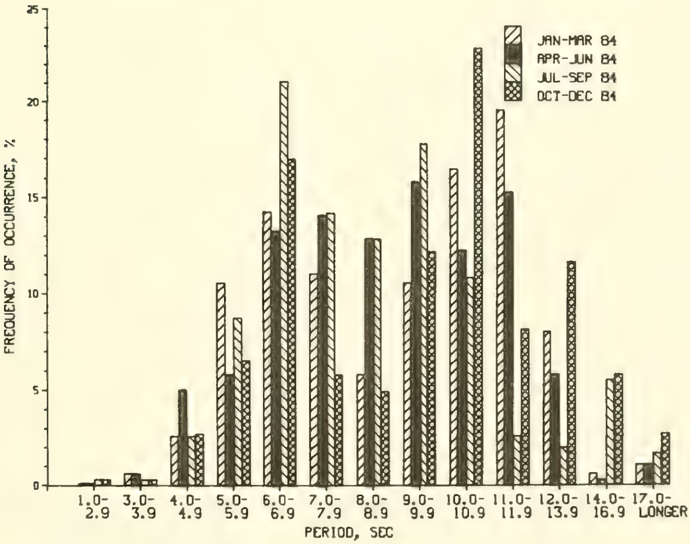


Figure B26. 1984 seasonal distribution of T_p for gage 620

Table B16

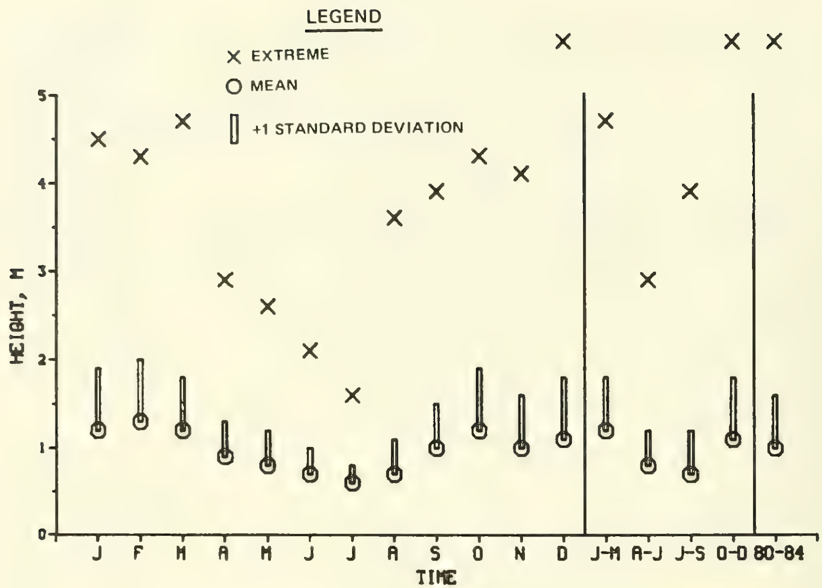
1984 Persistence of H_{m_o} for Gage 620

Height m	Consecutive Day(s) or Longer																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	31	45	62
0.5	23	19	18	17		16	14	13	12			10		9	7	6							5	4		3	2	1
1.0	50	32	25	16	12	9	6				3					2	1											
1.5	32	19	9		3	2				1																		
2.0	14	5			2																							
2.5	5		2																									
3.0	3	1																										
3.5	1																											
4.0																												

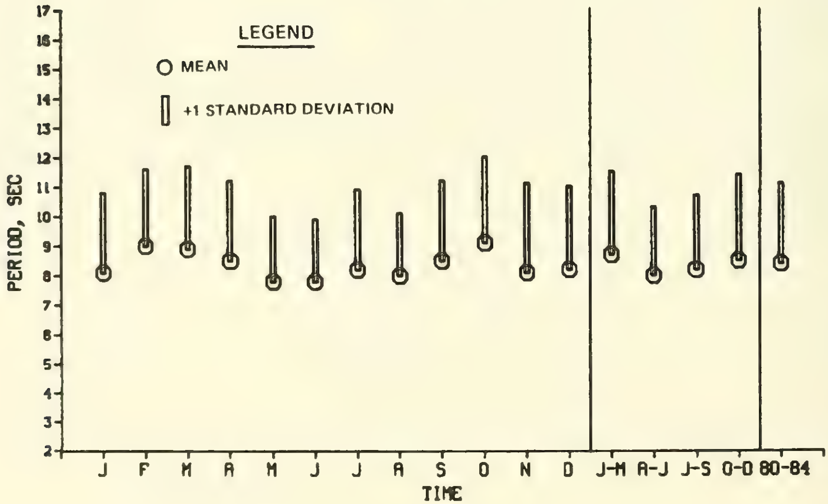
Table B17

1980 Through 1984 Mean, Standard Deviation, and Extreme H_{m_o} and T_p for Gage 620

Month	Mean Height, m	Standard Deviation Height, m	Mean Period sec	Standard Deviation Period sec	Extreme Height, m	Date	Number Observations
Jan	1.2	0.7	8.1	2.7	4.5	28	519
Feb	1.3	0.7	8.0	2.6	4.3	14	460
Mar	1.2	0.6	8.9	2.8	4.7	25	521
Apr	0.9	0.4	8.5	2.7	2.9	24	504
May	0.8	0.4	7.8	2.2	2.6	4	526
Jun	0.7	0.3	7.8	2.1	2.1	9	478
Jul	0.6	0.2	8.2	2.7	1.6	28	493
Aug	0.7	0.4	8.0	2.1	3.6	20	471
Sep	1.0	0.5	8.5	2.7	3.9	29	506
Oct	1.2	0.7	9.1	2.9	4.3	24	594
Nov	1.0	0.6	8.1	3.0	4.1	13	421
Dec	1.1	0.7	8.2	2.8	5.6	28	530
Jan-Mar	1.2	0.6	8.7	2.8	4.7	Mar	1,500
Apr-Jun	0.8	0.4	8.0	2.3	2.9	Apr	1,508
Jul-Sep	0.7	0.5	8.2	2.5	3.9	Sep	1,470
Oct-Dec	1.1	0.7	8.5	2.9	5.6	Dec	1,545
Annual	1.0	0.6	8.4	2.7	5.6	Dec	6,023



a. Height



b. Period

Figure B27. 1980 through 1984 mean, standard deviation, and extreme H_{m_o} and T_p for gage 620

Table B18

1980 Through 1984 Annual Joint Distribution of

H_{m_o} Versus T_p for Gage 620

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	1	1	2	5	8	12	24	32	19	7	15	10	1	137
.50 - .99	2	8	27	43	57	51	57	73	59	44	23	17	3	464
1.00 - 1.49	.	.	9	33	49	31	18	19	27	21	19	4	1	231
1.50 - 1.99	.	.	.	8	27	13	6	6	10	6	12	5	1	94
2.00 - 2.49	.	.	.	1	8	9	3	5	5	5	6	4	.	46
2.50 - 2.99	.	.	.	.	1	4	1	2	2	2	3	1	.	16
3.00 - 3.49	.	.	.	.	.	.	1	1	1	1	1	.	.	5
3.50 - 3.99	.	.	.	.	.	.	.	1	1	1	.	1	.	4
4.00 - 4.49	.	.	.	.	.	.	.	.	.	1	.	.	.	1
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	9	38	90	150	120	110	139	124	88	79	42	6	

Table B19

1980 Through 1984 Seasonal Joint Distribution of

H_{m_o} Versus T_p for Gage 620

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	1	.	.	5	4	1	6	4	11	6	9	3	.	50
.50 - .99	.	9	22	36	39	28	23	47	66	49	30	13	1	363
1.00 - 1.49	.	1	13	46	53	32	20	23	47	35	37	7	.	314
1.50 - 1.99	.	.	1	15	32	22	7	11	21	10	20	8	.	147
2.00 - 2.49	.	.	.	3	11	12	5	7	9	7	11	9	1	75
2.50 - 2.99	.	.	.	.	1	5	1	2	6	3	10	3	.	31
3.00 - 3.49	.	.	.	.	.	.	2	1	1	4	1	1	.	10
3.50 - 3.99	.	.	.	.	.	.	.	1	1	1	1	.	.	4
4.00 - 4.49	.	.	.	.	.	.	1	.	1	1	1	.	.	4
4.50 - 4.99	.	.	.	.	.	.	.	.	1	1	.	.	.	2
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	1	10	36	105	140	100	65	96	164	117	120	44	2	

(Continued)

Table B19 (Concluded)

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	1	3	5	11	19	35	40	17	8	6	2	1	148
.50 - .99	5	11	41	57	59	71	95	107	63	50	19	12	.	590
1.00 - 1.49	.	1	9	18	33	27	23	23	22	21	15	1	.	193
1.50 - 1.99	.	.	1	5	11	8	5	4	11	2	7	1	.	55
2.00 - 2.49	.	.	.	1	1	3	1	4	.	1	1	1	.	13
2.50 - 2.99	.	.	.	.	.	1	1	.	.	.	.	1	.	3
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	5	13	54	86	115	129	160	178	113	82	48	18	1	

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	1	2	4	8	16	22	47	71	32	7	17	21	2	250
.50 - .99	.	7	20	44	74	73	80	92	53	33	16	23	4	519
1.00 - 1.49	.	1	3	30	42	31	16	10	9	6	7	3	1	159
1.50 - 1.99	.	.	.	3	14	7	3	6	.	3	5	1	.	42
2.00 - 2.49	.	.	.	1	3	1	1	2	4	1	2	1	.	16
2.50 - 2.99	.	.	.	.	1	2	2	1	1	.	1	.	.	8
3.00 - 3.49	.	.	.	.	.	1	.	1	1	1	1	.	.	5
3.50 - 3.99	.	.	.	.	.	.	.	1	1	.	1	.	.	3
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	1	10	27	86	150	137	149	184	101	51	50	49	7	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	1	1	3	3	2	6	9	14	17	7	28	13	1	105
.50 - .99	3	7	24	36	58	34	29	45	54	45	27	19	6	387
1.00 - 1.49	.	.	10	39	66	36	14	19	28	21	18	6	2	259
1.50 - 1.99	.	.	.	10	50	14	7	5	7	9	16	9	3	130
2.00 - 2.49	.	.	.	1	16	19	5	6	6	8	9	5	1	76
2.50 - 2.99	.	.	.	.	1	6	1	5	1	4	3	1	.	22
3.00 - 3.49	.	.	.	.	.	1	3	1	1	1	3	1	.	11
3.50 - 3.99	.	.	.	.	.	.	.	1	2	2	1	3	.	9
4.00 - 4.49	.	.	.	.	.	.	.	.	.	1	.	1	.	2
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	1	1	.	2
TOTAL	4	8	37	89	193	116	68	96	116	98	106	59	13	

Table B20

1980 Through 1984 Monthly Joint Distribution

of H_{m_o} Versus T_p for Gage 620

MONTH JAN

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	2	.	.	13	6	.	12	8	23	4	4	4	.	76
.50 - .99	.	15	23	44	31	31	13	39	54	64	33	13	.	360
1.00 - 1.49	.	.	13	66	60	27	4	12	39	37	12	.	.	270
1.50 - 1.99	.	.	2	17	52	31	6	10	25	10	8	2	.	163
2.00 - 2.49	.	.	.	2	13	29	6	4	10	12	4	8	2	90
2.50 - 2.99	.	.	.	.	.	10	4	4	4	2	8	4	.	36
3.00 - 3.49	.	.	.	.	.	.	4	.	2	2	.	.	.	8
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	2	.	.	.	.	2
4.50 - 4.99	.	.	.	.	.	.	.	.	.	2	.	.	.	2
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	2	15	38	142	162	128	49	77	159	133	69	31	2	

MONTH FEB

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	4	.	2	.	4	2	15	.	.	27
.50 - .99	.	7	9	26	41	9	26	43	76	61	24	2	2	326
1.00 - 1.49	.	2	9	39	54	22	37	41	50	33	41	7	.	335
1.50 - 1.99	.	.	.	13	28	26	13	15	20	7	28	7	.	157
2.00 - 2.49	.	.	.	9	13	4	4	11	13	4	15	13	.	86
2.50 - 2.99	.	.	.	.	.	7	.	.	13	9	15	2	.	46
3.00 - 3.49	.	.	.	.	.	.	.	2	.	4	2	4	.	12
3.50 - 3.99	.	.	.	.	.	.	.	.	.	2	.	.	.	2
4.00 - 4.49	.	.	.	.	.	.	.	.	2	4	.	.	.	6
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	9	18	87	140	68	82	112	178	126	140	35	2	

MONTH MAR

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	.	.	2	2	4	4	6	12	10	4	.	44
.50 - .99	.	4	33	36	44	42	31	69	69	25	33	21	.	398
1.00 - 1.49	.	.	15	33	46	46	21	19	54	36	58	13	.	341
1.50 - 1.99	.	.	.	15	15	10	4	8	17	13	25	15	.	122
2.00 - 2.49	.	.	.	.	6	2	6	6	6	6	13	6	.	51
2.50 - 2.99	.	.	.	.	4	.	.	2	2	.	8	4	.	20
3.00 - 3.49	.	.	.	.	.	.	2	2	2	6	2	.	.	14
3.50 - 3.99	.	.	.	.	.	.	.	4	2	.	2	.	.	8
4.00 - 4.49	.	.	.	.	.	.	2	.	.	.	2	.	.	4
4.50 - 4.99	.	.	.	.	.	.	.	.	2	.	.	.	.	2
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	4	48	84	117	102	70	105	160	98	153	63	0	

(Continued)

(Sheet 1 of 4)

Table B20 (Continued)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	2	4	4	6	.	24	18	10	10	12	2	.	92
.50 - .99	12	12	30	42	56	56	56	63	71	87	40	22	.	547
1.00 - 1.49	.	2	12	20	36	42	16	34	26	34	28	2	.	252
1.50 - 1.99	.	.	.	8	16	12	6	10	20	2	18	.	.	92
2.00 - 2.49	.	.	.	2	.	.	2	8	.	4	.	.	.	16
2.50 - 2.99	.	.	.	.	.	2	4	.	.	.	.	.	.	6
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	12	16	46	76	114	112	108	133	127	137	98	26	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	2	6	8	23	23	32	17	8	4	2	.	125
.50 - .99	.	11	53	63	49	78	110	148	59	34	13	2	.	620
1.00 - 1.49	.	.	10	21	42	19	29	19	30	19	8	.	.	197
1.50 - 1.99	.	.	.	4	11	4	10	.	8	.	4	2	.	43
2.00 - 2.49	.	.	.	2	2	6	.	2	.	.	2	2	.	16
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	2	.	2
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	11	65	96	112	130	172	201	114	61	31	10	0	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	2	6	21	33	61	73	25	6	2	2	2	233
.50 - .99	2	10	40	67	73	79	121	109	59	27	2	13	.	602
1.00 - 1.49	.	.	6	13	21	21	25	17	8	8	10	.	.	129
1.50 - 1.99	.	.	2	2	4	8	.	2	4	4	.	.	.	26
2.00 - 2.49	.	.	.	.	2	2	2	2	.	.	.	.	.	8
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	2	10	50	88	121	143	209	203	96	45	14	15	2	

(Continued)

(Sheet 2 of 4)

Table B20 (Continued)

MONTH JUL

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	2	4	4	8	26	26	73	116	34	8	22	26	4	353
.50 - .99	.	12	24	45	95	75	95	108	47	6	2	32	12	553
1.00 - 1.49	.	2	2	20	28	16	8	6	.	.	.	.	.	82
1.50 - 1.99	.	.	.	2	.	.	4	.	.	.	.	.	.	6
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	2	18	30	75	149	117	180	230	81	14	24	58	16	

MONTH AUG

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	2	6	11	21	40	64	72	51	6	21	13	.	307
.50 - .99	.	2	17	59	72	96	96	98	57	21	15	11	.	544
1.00 - 1.49	.	.	2	19	28	28	8	2	2	4	.	.	.	93
1.50 - 1.99	.	.	.	2	11	8	4	.	.	2	4	.	.	31
2.00 - 2.49	.	.	.	.	2	.	2	.	.	2	2	.	.	8
2.50 - 2.99	.	.	.	.	2	.	2	.	2	.	2	.	.	8
3.00 - 3.49	.	.	.	.	.	2	.	.	.	2	.	.	.	4
3.50 - 3.99	.	.	.	.	.	.	.	2	.	.	.	.	.	2
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	4	25	91	136	174	176	174	112	37	44	24	0	

MONTH SEP

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	.	2	6	2	2	6	28	12	6	8	24	2	99
.50 - .99	.	6	18	28	55	49	49	71	55	71	30	26	.	458
1.00 - 1.49	.	.	6	49	69	47	30	22	24	14	22	10	2	295
1.50 - 1.99	.	.	.	6	32	14	.	18	.	8	10	2	.	90
2.00 - 2.49	.	.	.	2	6	2	2	6	12	2	4	4	.	40
2.50 - 2.99	.	.	.	.	.	6	4	2	.	.	.	.	.	12
3.00 - 3.49	.	.	.	.	.	.	.	2	2	.	2	.	.	6
3.50 - 3.99	.	.	.	.	.	.	.	.	2	.	2	.	.	4
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	6	26	91	164	120	91	149	107	101	78	66	4	

(Continued)

(Sheet 3 of 4)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	2	.	.	.	2	7	17	15	25	10	17	7	.	102
.50 - .99	.	3	10	22	35	24	37	44	59	51	42	27	2	356
1.00 - 1.49	.	.	7	52	45	25	8	19	29	25	27	12	.	249
1.50 - 1.99	.	.	.	7	49	7	5	3	8	12	35	15	7	148
2.00 - 2.49	.	.	.	.	13	27	5	5	12	8	15	7	2	95
2.50 - 2.99	.	.	.	.	2	12	2	8	2	2	7	2	.	37
3.00 - 3.49	.	.	.	.	.	2	.	.	.	.	5	.	.	7
3.50 - 3.99	.	.	.	.	.	.	.	2	.	.	.	3	.	5
4.00 - 4.49	.	.	.	.	.	.	.	.	.	3	.	.	.	3
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	2	3	17	81	146	104	74	96	136	111	148	73	11	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	2	2	2	5	2	12	7	19	12	7	24	12	.	106
.50 - .99	5	5	55	55	64	59	26	45	36	48	12	17	12	439
1.00 - 1.49	.	.	10	26	88	40	17	26	26	26	7	2	7	275
1.50 - 1.99	.	.	.	12	33	24	7	2	7	7	2	12	2	108
2.00 - 2.49	.	.	.	2	5	7	7	2	.	5	2	2	.	32
2.50 - 2.99	.	.	.	.	.	2	.	2	.	5	2	.	.	11
3.00 - 3.49	.	.	.	.	.	.	2	2	.	.	2	2	.	8
3.50 - 3.99	.	.	.	.	.	.	.	.	7	.	2	5	.	14
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	2	.	2
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	7	7	67	100	192	144	66	96	88	98	53	54	21	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	2	8	4	2	.	2	9	13	4	45	21	2	112
.50 - .99	4	13	15	36	77	26	23	47	62	38	23	13	6	383
1.00 - 1.49	.	.	13	34	72	43	19	13	28	13	17	4	.	256
1.50 - 1.99	.	.	.	11	64	13	9	8	6	8	4	.	.	123
2.00 - 2.49	.	.	.	.	26	21	4	9	2	11	8	6	.	87
2.50 - 2.99	.	.	.	.	.	4	.	4	.	6	.	.	.	14
3.00 - 3.49	.	.	.	.	.	.	8	2	2	2	2	.	.	16
3.50 - 3.99	.	.	.	.	.	.	.	2	.	6	.	.	.	8
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	2	2	.	4
TOTAL	4	15	36	85	241	107	65	94	113	88	101	46	8	

(Sheet 4 of 4)

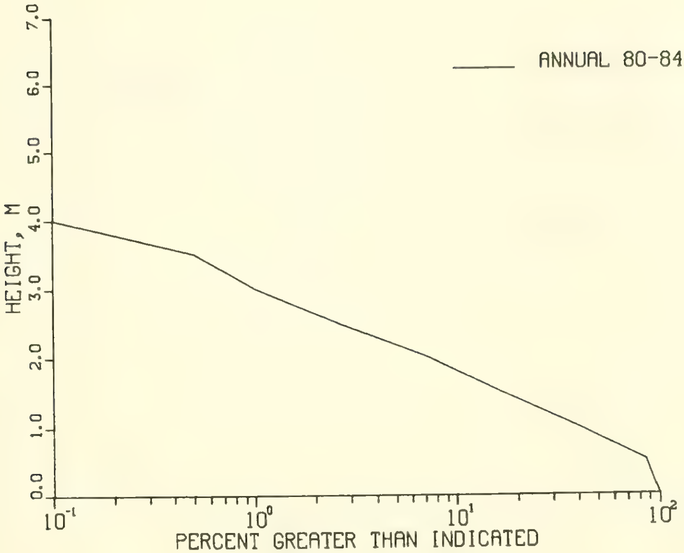


Figure B28. 1980 through 1984 annual cumulative distribution of H_{m_o} for gage 620

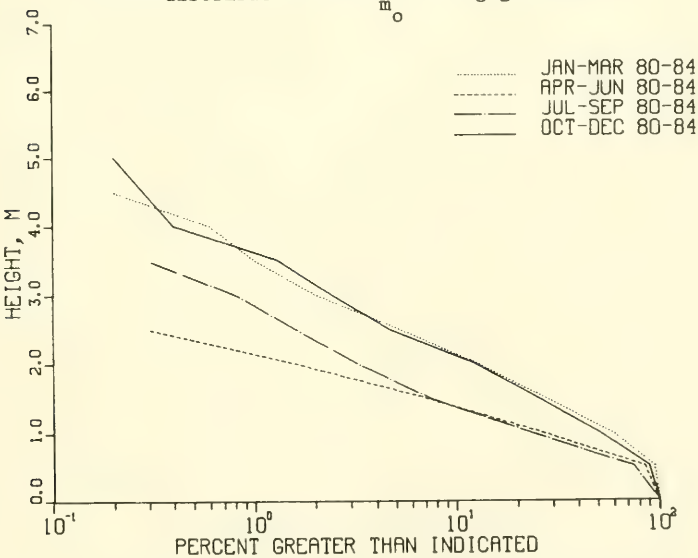
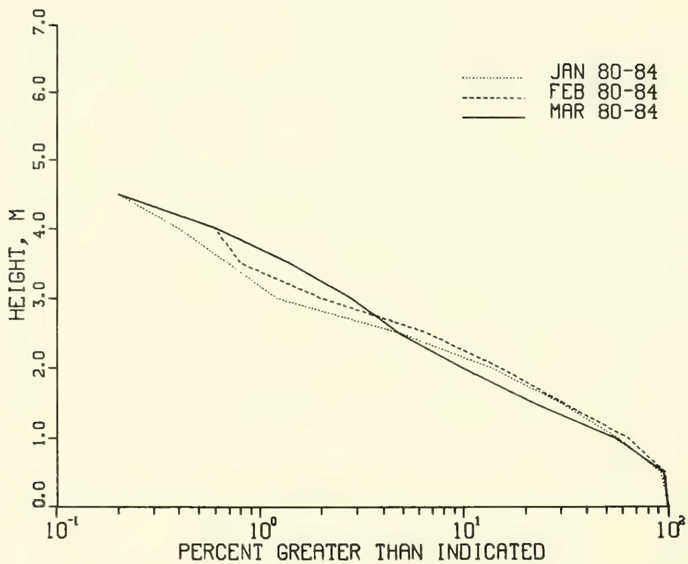


Figure B29. 1980 through 1984 seasonal cumulative distribution of H_{m_o} for gage 620



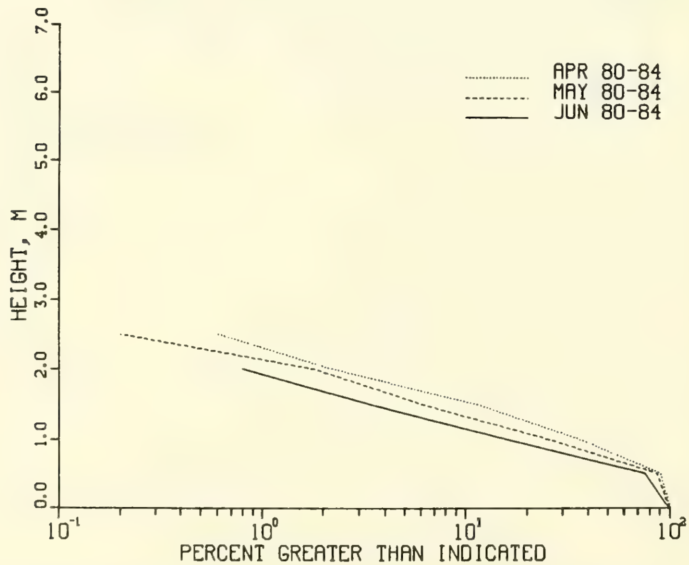


Figure B30. 1980 through 1984 monthly cumulative distribution of H_{m_o} for gage 620 (Continued)

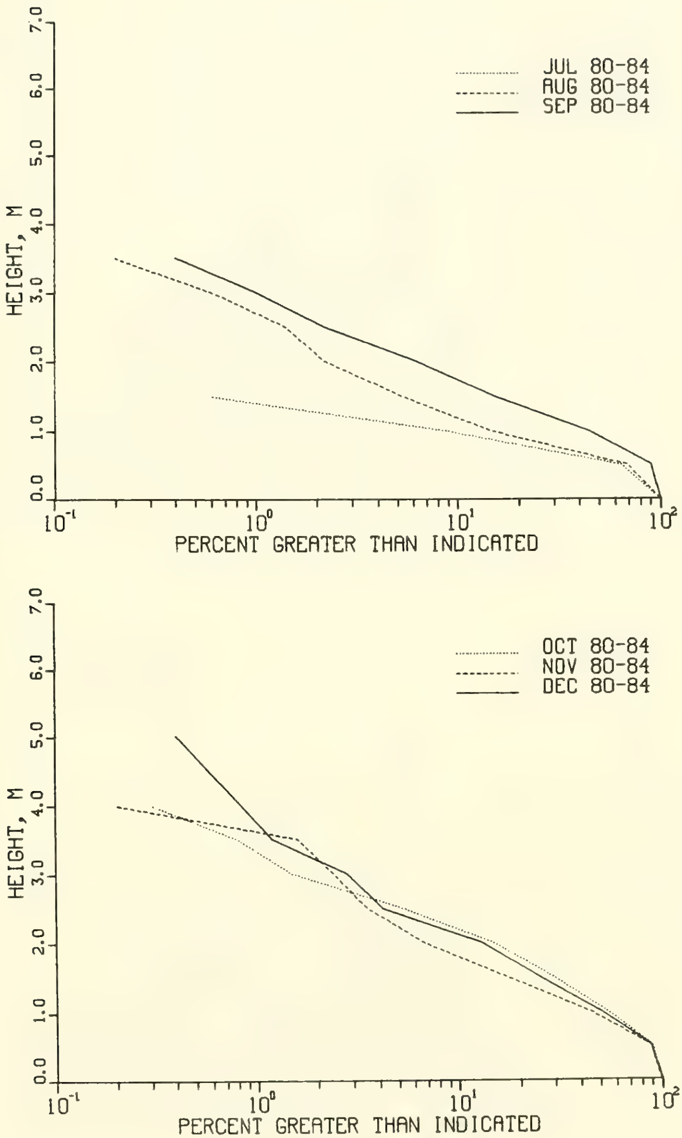


Figure B30. (Concluded)

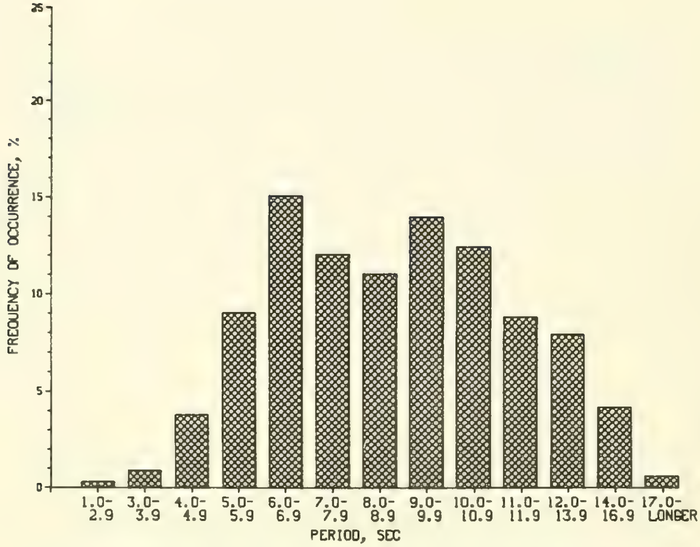


Figure B31. 1980 through 1984 annual distribution of T_p for gage 620

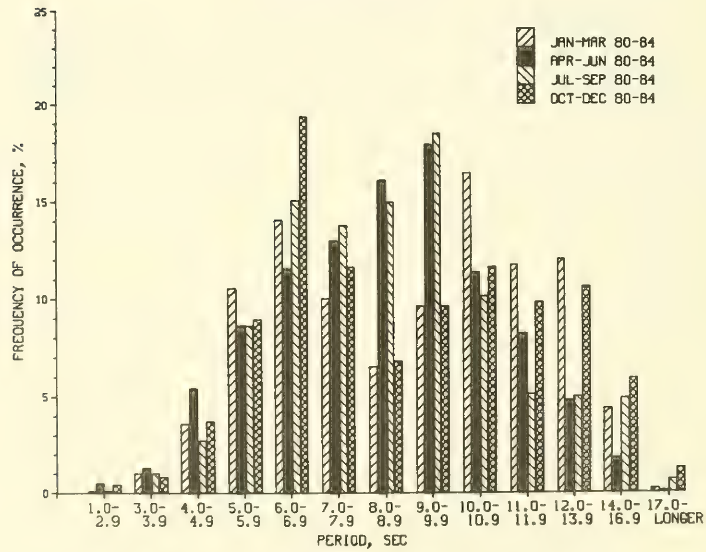
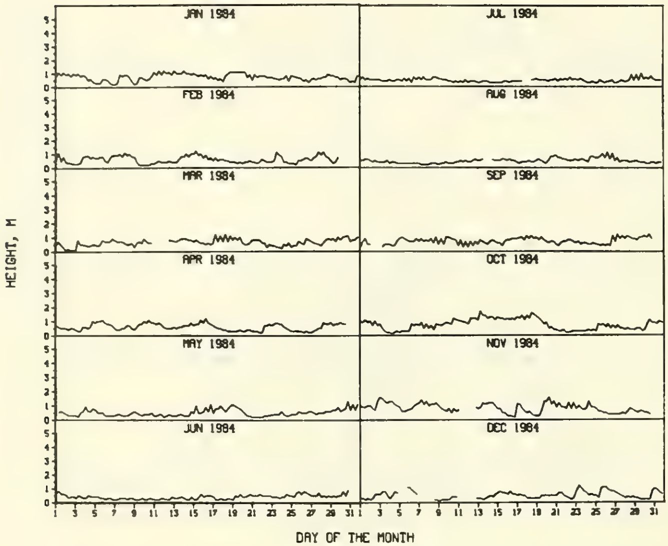


Figure B32. 1980 through 1984 seasonal distribution of T_p for gage 620

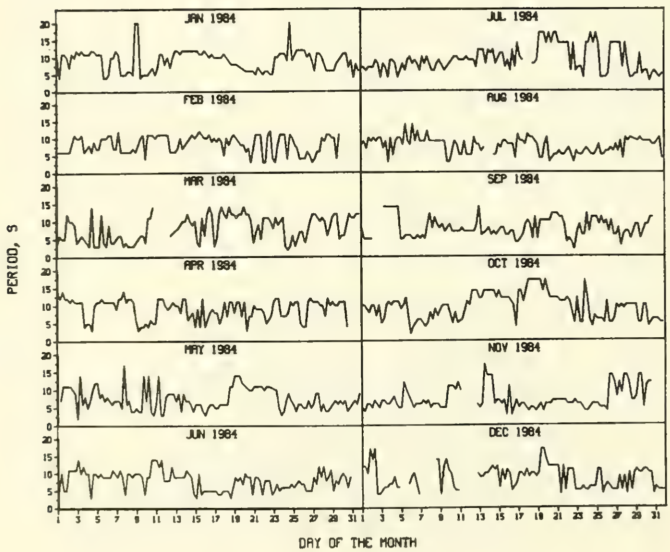
Table B21

1980 Through 1984 Persistence of H_{m_o} for Gage 620

Height	Consecutive Day(s) or Longer																									
m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	29
0.5	25	21	18	16	13		12			10				8	7	6										3
1.0	50	32	25	18	14	10	8				3						2									
1.5	35	20	11	8	5	4																				
2.0	21	11	7	3	2	1																				
2.5	11	5	2	1																						
3.0	5	3		1																						
3.5	3	2	1																							
4.0	1																									



a. Height



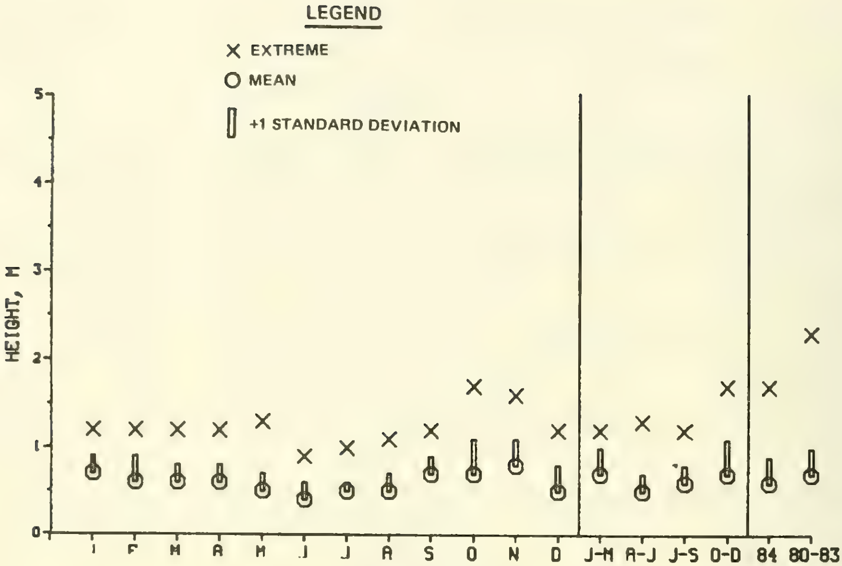
b. Period

Figure B33. Time-history of H_{m_o} and T_p for gage 615

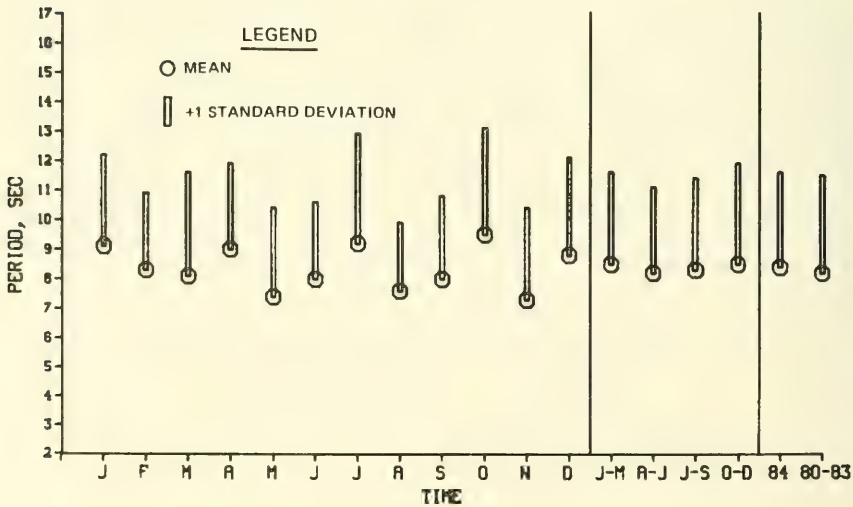
Table B22

1984 Mean, Standard Deviation, and Extreme H_{m_0} and T_p for Gage 615

Month	Mean Height, m	Standard Deviation Height, m	Mean Period sec	Standard Deviation Period sec	Extreme Height, m	Date	Number Observations
Jan	0.7	0.2	9.1	3.1	1.2	11	118
Feb	0.6	0.3	8.3	2.6	1.2	15	114
Mar	0.6	0.2	8.1	3.5	1.2	17	113
Apr	0.6	0.2	9.0	2.9	1.2	16	119
May	0.5	0.2	7.4	3.0	1.3	30	117
Jun	0.4	0.2	8.0	2.6	0.9	30	115
Jul	0.5	0.1	9.2	3.7	1.0	29	119
Aug	0.5	0.2	7.6	2.3	1.1	26	118
Sep	0.7	0.2	8.0	2.8	1.2	27	112
Oct	0.7	0.4	9.5	3.6	1.7	13	115
Nov	0.8	0.3	7.3	3.1	1.6	3	110
Dec	0.5	0.3	8.8	3.3	1.2	23	106
Jan-Mar	0.7	0.3	8.5	3.1	1.2	Jan	345
Apr-Jun	0.5	0.2	8.2	2.9	1.3	May	351
Jul-Sep	0.6	0.2	8.3	3.1	1.2	Sep	349
Oct-Dec	0.7	0.4	8.5	3.4	1.7	Oct	331
Annual	0.6	0.3	8.4	3.2	1.7	Oct	1,376



a. Height



b. Period

Figure B34. 1984 mean, standard deviation, and extreme H_{m_o} and T_p for gage 615

Table B23

1984 Annual Joint Distribution of H_{m_0} Versus T_p

for Gage 615

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	2	9	20	20	16	25	22	57	53	61	23	23	8	339
.50 - .99	1	20	48	78	89	53	35	39	55	50	45	19	5	537
1.00 - 1.49	.	.	2	17	28	12	6	7	7	11	14	13	3	120
1.50 - 1.99	.	.	.	.	1	1	.	.	.	.	1	.	1	4
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	29	70	115	134	91	63	103	115	122	83	55	17	

Table B24

1984 Seasonal Joint Distribution of H_{m_0}

Versus T_p for Gage 615

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	3	9	20	9	17	12	17	12	38	81	14	3	9	244
.50 - .99	.	46	46	55	104	41	20	35	101	96	72	12	.	628
1.00 - 1.49	.	.	3	9	20	9	12	6	9	26	32	3	.	129
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	55	69	73	141	62	49	53	148	203	118	18	9	

(Continued)

Table B24 (Concluded)

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	3	17	37	31	28	51	17	88	60	85	20	23	3	463
.50 - .99	.	14	57	71	57	54	43	40	37	51	51	11	.	486
1.00 - 1.49	.	.	.	6	14	3	.	3	3	9	6	6	.	50
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	31	94	108	99	108	60	131	100	145	77	40	3	

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	6	11	14	6	26	49	103	46	20	23	46	9	359
.50 - .99	3	14	46	83	97	83	63	66	32	23	14	37	14	575
1.00 - 1.49	.	.	.	20	14	6	6	11	6	3	.	.	.	66
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	20	57	117	117	115	118	180	84	46	37	83	23	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	3	3	12	27	12	12	3	24	69	57	36	21	12	291
.50 - .99	.	3	42	106	97	33	12	15	48	30	42	15	6	449
1.00 - 1.49	.	.	6	36	63	33	6	6	9	6	18	45	12	240
1.50 - 1.99	.	.	.	.	3	6	.	.	.	.	3	.	3	15
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	6	60	169	175	84	21	45	126	93	99	81	33	

Table B25

1984 Monthly Joint Distribution of H_{m_0} Versus

T_p for Gage 615

MONTH JAN

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	8	8	.	.	8	8	17	51	25	.	25	150
.50 - .99	.	.	25	93	127	34	17	34	119	144	68	.	.	661
1.00 - 1.49	.	.	8	8	8	25	25	.	17	34	59	.	.	184
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	41	109	135	59	50	42	153	229	152	0	25	

MONTH FEB

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	35	.	44	35	35	9	70	158	9	.	.	395
.50 - .99	.	44	35	18	96	53	26	35	105	70	18	.	.	500
1.00 - 1.49	.	.	.	.	44	.	9	18	9	26	.	.	.	106
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	44	70	18	184	88	70	62	184	254	27	0	0	

MONTH MAR

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	9	27	18	18	9	.	9	18	27	35	9	9	.	188
.50 - .99	.	97	80	53	88	35	18	35	80	71	133	35	.	725
1.00 - 1.49	.	.	.	18	9	.	.	.	.	18	35	9	.	89
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	9	124	98	89	106	35	27	53	107	124	177	53	0	

(Continued)

(Sheet 1 of 4)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	8	17	8	8	34	17	25	17	143	25	.	.	302
.50 - .99	.	17	67	50	17	59	50	34	76	118	118	25	.	631
1.00 - 1.49	.	.	.	8	17	.	.	.	8	17	17	.	.	67
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	25	84	66	42	93	67	59	101	278	160	25	0	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	9	26	43	17	51	94	17	68	43	60	.	34	9	471
.50 - .99	.	17	77	77	128	60	17	17	9	17	26	9	.	454
1.00 - 1.49	.	.	.	9	26	9	.	9	.	9	.	17	.	79
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	9	43	120	103	205	163	34	94	52	86	26	60	9	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	17	52	70	26	26	17	174	122	52	35	35	.	626
.50 - .99	.	9	26	87	26	43	61	70	26	17	9	.	.	374
1.00 - 1.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	26	78	157	52	69	78	244	148	69	44	35	0	

(Continued)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	25	8	9	34	67	92	25	25	50	92	25	451
.50 - .99	.	8	59	42	101	76	59	42	34	8	.	67	42	538
1.00 - 1.49	.	.	.	8	.	.	.	.	.	.	.	.	.	8
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	8	84	58	109	110	126	134	59	33	50	159	67	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	17	8	34	8	8	59	212	93	17	17	17	.	490
.50 - .99	.	25	42	119	68	51	85	59	34	.	.	.	.	483
1.00 - 1.49	.	.	.	8	17	.	.	.	.	.	.	.	.	25
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	42	50	161	93	59	144	271	127	17	17	17	0	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	.	.	.	.	.	36	18	.	18	18	.	27	.	117
.50 - .99	9	9	36	89	125	125	45	98	27	62	45	45	.	715
1.00 - 1.49	.	.	.	45	27	18	18	36	18	9	.	.	.	171
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	9	9	36	134	152	179	81	134	63	89	45	72	0	

(Continued)

Table B25 (Concluded)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	9	.	9	26	17	17	.	17	78	70	52	.	9	304
.50 - .99	.	.	26	96	87	9	17	17	78	17	17	9	9	382
1.00 - 1.49	.	.	9	26	9	9	9	9	26	17	52	104	26	296
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	9	.	9	18
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	9	0	44	148	113	35	26	43	182	104	130	113	53	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	9	9	18	9	9	9	9	.	9	27	27	.	135
.50 - .99	.	9	55	109	109	73	9	.	27	36	36	27	.	490
1.00 - 1.49	.	.	.	73	155	73	9	.	.	.	.	27	9	346
1.50 - 1.99	.	.	.	.	9	18	.	.	.	.	.	.	.	27
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	18	64	200	282	173	27	9	27	45	63	81	9	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	19	38	9	9	.	47	132	94	28	38	28	442
.50 - .99	.	.	47	113	94	19	9	28	38	38	75	9	9	479
1.00 - 1.49	.	.	9	9	28	19	.	9	.	.	.	.	.	74
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	0	75	160	131	47	9	84	170	132	103	47	37	

(Sheet 4 of 4)

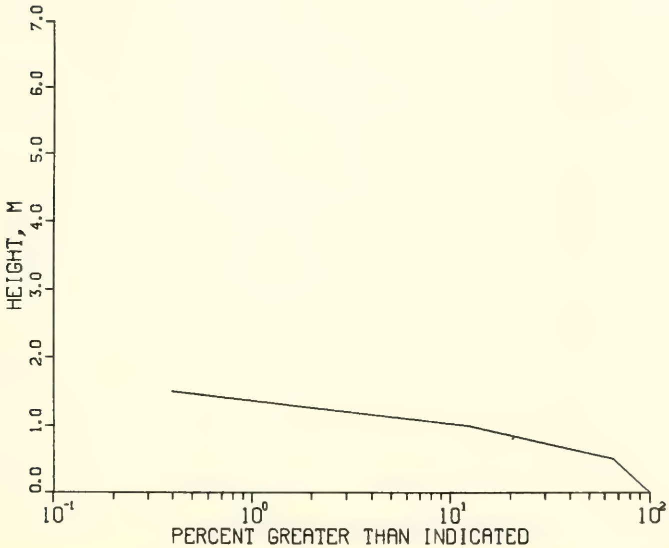


Figure B35. 1984 annual cumulative distribution of H_{m_o} for gage 615

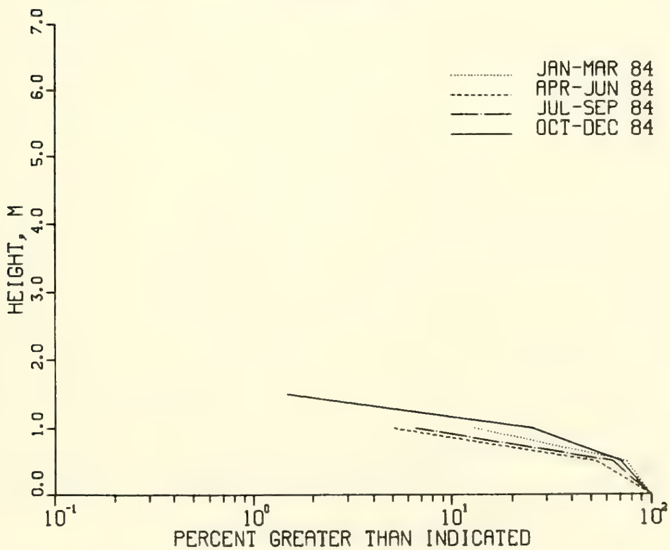
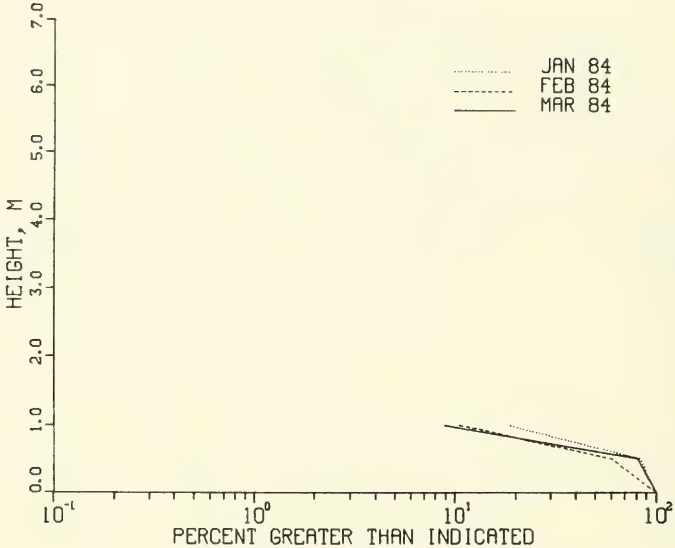


Figure B36. 1984 seasonal cumulative distribution of H_{m_o} for gage 615



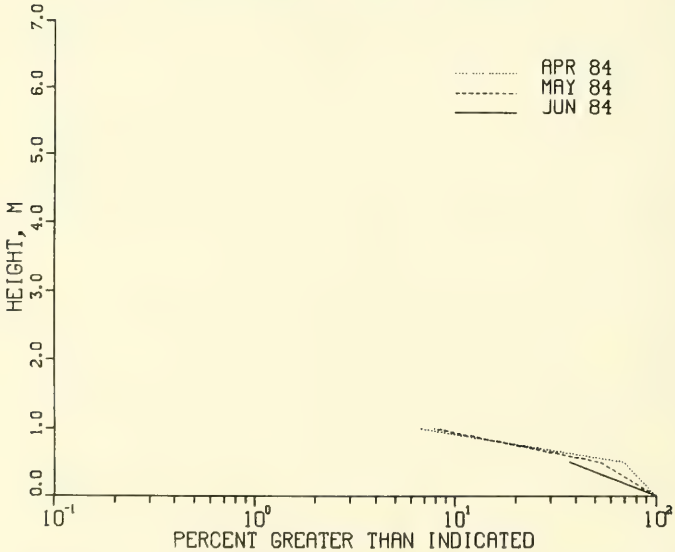
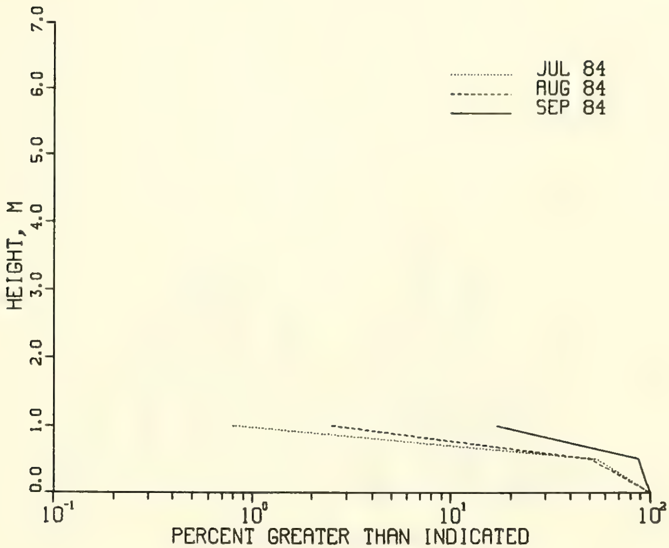


Figure B37. 1984 monthly cumulative distribution of H_{m_o} for gage 615 (Continued)



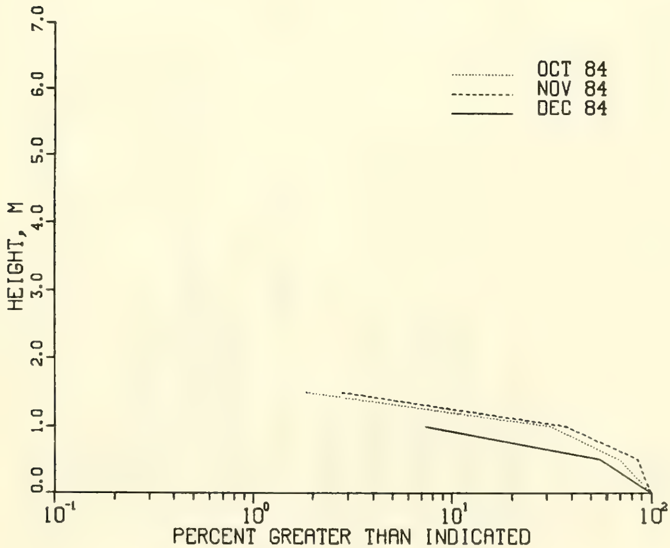


Figure B37. (Concluded)

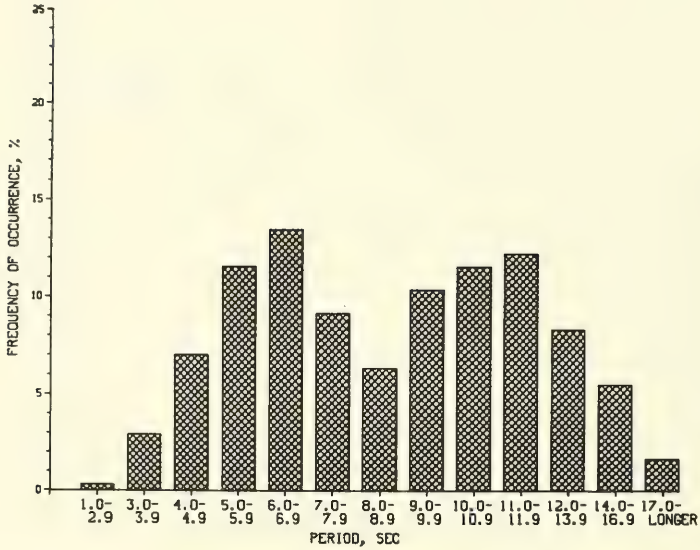


Figure B38. 1984 annual distribution of T_p for gage 615

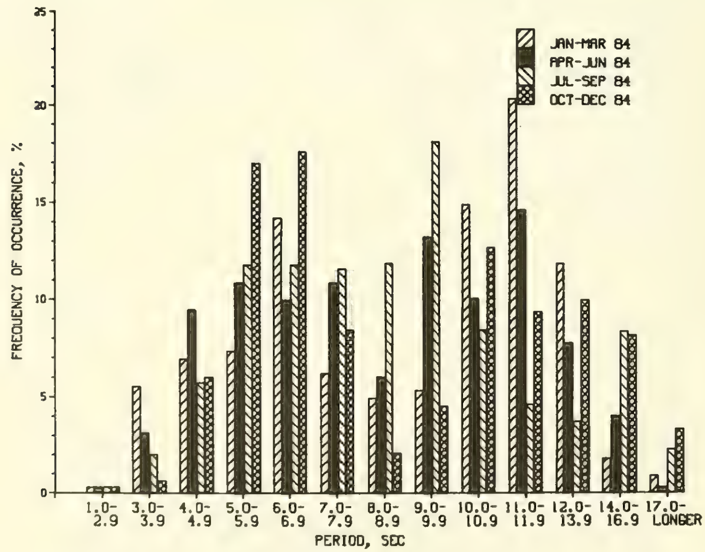


Figure B39. 1984 seasonal distribution of T_p for gage 615

Table B26

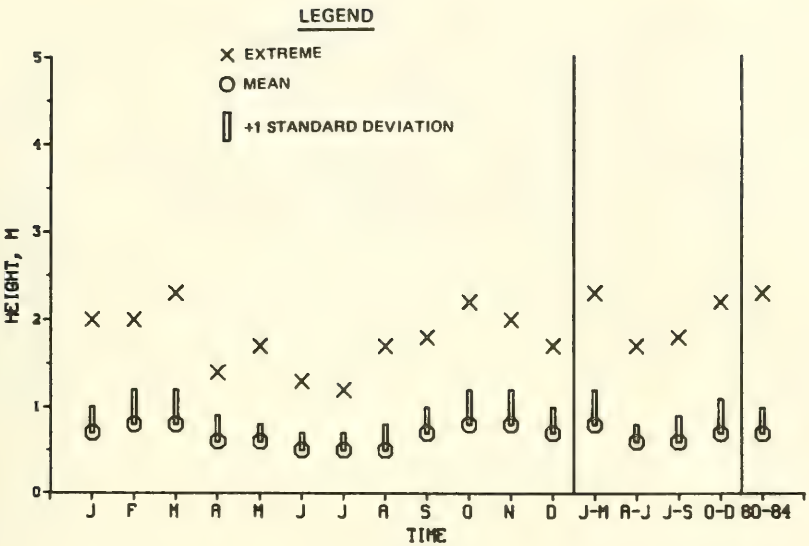
1984 Persistence of H_{m_o} for Gage 615

Height	Consecutive Day(s) or Longer																								
m	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	33
0.5	32	30	27	23	21	18	15	14	12	11	10	9		7	6	5						4			3	2
1.0	32	23	13	7	6	4	2			1																
1.5	4																									
2.0																										
2.5																										
3.0																										
3.5																										
4.0																										

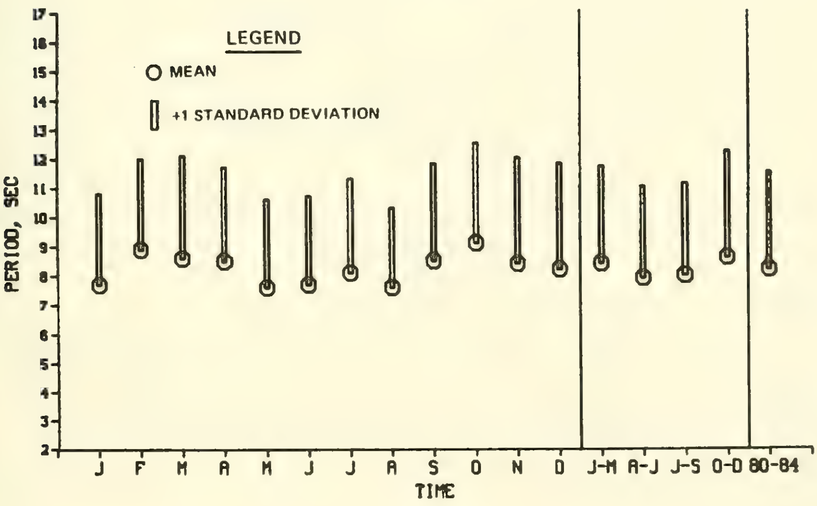
Table B27

1980 Through 1984 Mean, Standard Deviation, and Extreme H_{m_o} and T_p for Gage 615

Month	Mean Height, m	Standard Deviation Height, m	Mean Period sec	Standard Deviation Period sec	Extreme Height, m	Date	Number Observations
Jan	0.7	0.3	7.7	3.1	2.0	18	439
Feb	0.8	0.4	8.9	3.1	2.0	21	458
Mar	0.8	0.4	8.6	3.5	2.3	3	522
Apr	0.6	0.3	8.5	3.2	1.4	7	458
May	0.6	0.2	7.6	3.0	1.7	4	538
Jun	0.5	0.2	7.7	3.0	1.3	10	504
Jul	0.5	0.2	8.1	3.2	1.2	1	516
Aug	0.5	0.3	7.6	2.7	1.7	29	513
Sep	0.7	0.3	8.5	3.3	1.8	29	477
Oct	0.8	0.4	9.1	3.4	2.2	11	555
Nov	0.8	0.4	8.4	3.6	2.0	14	526
Dec	0.7	0.3	8.2	3.6	1.7	13	506
Jan-Mar	0.8	0.4	8.4	3.3	2.3	Mar	1,419
Apr-Jun	0.6	0.2	7.9	3.1	1.7	May	1,500
Jul-Sep	0.6	0.3	8.0	3.1	1.8	Sep	1,506
Oct-Dec	0.7	0.4	8.6	3.6	2.2	Oct	1,588
Annual	0.7	0.3	8.2	3.3	2.3	Mar	6,012



a. Height



b. Period

Figure B40. 1980 through 1984 mean, standard deviation, and extreme H_{m_o} and T_p for gage 615

Table B28

1980 Through 1984 Annual Joint Distribution of H_{m_o}

Versus T_p for Gage 615

ANNUAL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	2	7	18	31	24	27	33	43	39	29	29	34	10	326
.50 - .99	1	16	49	91	85	45	32	36	44	32	33	21	5	490
1.00 - 1.49	.	.	2	22	38	21	7	9	9	12	21	12	1	154
1.50 - 1.99	.	.	.	.	3	3	1	1	1	3	6	4	1	23
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	1	.	1
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	23	69	144	150	96	73	89	93	76	89	72	17	

Table B29

1980 Through 1984 Seasonal Joint Distribution

of H_{m_o} Versus T_p for Gage 615

SEASONAL JAN-MAR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	
0.00 - .49	3	5	12	23	18	13	17	11	28	32	18	16	3	199
.50 - .99	2	24	38	93	87	37	24	30	62	40	54	32	1	524
1.00 - 1.49	.	.	5	26	49	28	12	11	13	23	41	22	.	230
1.50 - 1.99	.	.	.	1	3	6	2	4	4	6	12	10	.	48
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	1	2	.	3
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	5	29	55	143	157	84	55	56	107	101	126	82	4	

(Continued)

Table B29 (Concluded)

SEASONAL APR-JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	1	11	28	43	30	43	44	60	41	29	30	36	10	406
.50 - .99	2	17	65	103	71	46	48	45	45	36	20	11	4	513
1.00 - 1.49	.	.	1	10	16	7	7	7	9	7	11	2	.	77
1.50 - 1.99	.	.	.	.	1	.	.	.	1	.	1	1	.	4
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	28	94	156	118	96	99	112	96	72	62	50	14	

SEASONAL JUL-SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	2	8	19	39	35	39	61	81	58	25	29	44	11	451
.50 - .99	1	15	51	80	78	56	33	42	26	17	25	17	5	446
1.00 - 1.49	.	.	1	20	25	13	7	7	6	5	7	3	1	95
1.50 - 1.99	.	.	.	1	1	2	.	1	.	1	1	1	.	8
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	3	23	71	140	139	110	101	131	90	48	62	65	17	

SEASONAL OCT-DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	3	3	12	21	15	14	9	20	29	29	37	39	15	246
.50 - .99	1	9	42	88	103	42	24	28	43	33	35	23	10	481
1.00 - 1.49	.	.	4	31	63	36	4	11	8	16	26	23	4	226
1.50 - 1.99	.	.	.	1	6	4	1	2	2	7	11	6	3	43
2.00 - 2.49	.	.	.	.	.	1	.	.	1	.	1	1	.	4
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	12	58	141	187	97	38	61	83	85	110	92	32	

Table B30

1980 Through 1984 Monthly Joint Distribution

of H_{m_o} Versus T_p for Gage 615

MONTH JAN

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	7	7	11	41	23	16	23	14	25	14	21	21	7	230
.50 - .99	2	16	43	121	107	39	16	27	52	48	41	11	2	525
1.00 - 1.49	.	.	7	36	55	36	14	5	16	18	30	5	.	222
1.50 - 1.99	.	.	.	.	2	2	.	2	2	11	2	.	.	21
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	2	.	2
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	9	23	61	198	187	93	53	48	95	91	94	39	9	

MONTH FEB

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	.	.	11	9	13	17	17	4	37	55	11	4	2	180
.50 - .99	2	17	24	72	70	26	35	35	85	44	57	28	.	495
1.00 - 1.49	.	.	2	20	57	24	11	17	20	24	50	22	.	247
1.50 - 1.99	.	.	.	.	7	13	4	4	.	4	28	13	.	73
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	2	.	2
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	2	17	37	101	147	80	67	60	142	127	146	69	2	

MONTH MAR

PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	11.0-10.9	11.0-11.9	12.0-13.9	14.0-16.9	17.0-LONGER	TOTAL
0.00 - .49	2	8	13	21	17	6	11	15	23	27	21	21	.	185
.50 - .99	2	36	46	88	86	46	21	27	50	31	61	54	.	548
1.00 - 1.49	.	.	6	23	36	25	11	10	6	25	42	36	.	220
1.50 - 1.99	.	.	.	2	.	2	2	4	8	4	6	15	.	43
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	2	2	.	4
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	44	65	134	139	79	45	56	87	87	132	128	0	

(Continued)

(Sheet 1 of 4)

MONTH APR
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	2	11	17	28	24	41	31	31	22	48	50	39	7	351
.50 - .99	2	15	50	92	63	35	39	33	57	74	44	15	2	521
1.00 - 1.49	.	.	.	11	28	13	11	11	15	9	28	.	.	126
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	26	67	131	115	89	81	75	94	131	122	54	9	

MONTH MAY
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	2	13	26	39	28	39	41	58	46	26	32	26	6	382
.50 - .99	2	20	76	113	89	52	45	45	41	20	17	17	4	541
1.00 - 1.49	.	.	2	13	17	6	7	7	7	2	4	6	.	71
1.50 - 1.99	.	.	.	.	2	.	.	.	2	.	2	2	.	8
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	33	104	165	136	97	93	110	96	48	55	51	10	

MONTH JUN
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	.	10	40	60	38	48	60	89	52	16	10	44	18	485
.50 - .99	2	16	65	103	60	50	60	58	40	18	2	.	6	480
1.00 - 1.49	.	.	.	6	4	2	4	2	6	12	4	.	.	40
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	2	26	105	169	102	100	124	149	98	46	16	44	24	

(Continued)

(Sheet 2 of 4)

Table B30 (Continued)

MONTH JUL
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	4	8	33	39	45	39	101	110	70	35	27	56	16	583
.50 - .99	.	14	48	78	76	47	41	35	16	2	2	19	12	390
1.00 - 1.49	.	.	2	14	6	4	4	.	2	.	.	.	.	32
1.50 - 1.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	22	83	131	127	90	146	145	88	37	29	75	28	

MONTH AUG
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	.	14	16	60	45	49	62	105	66	18	31	39	4	509
.50 - .99	.	18	57	92	76	55	37	33	25	18	10	2	.	423
1.00 - 1.49	.	.	.	4	23	14	2	4	2	6	4	4	.	63
1.50 - 1.99	.	.	.	.	.	4	.	.	.	2	.	2	.	8
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	32	73	156	144	122	101	142	93	44	45	47	4	

MONTH SEP
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS)													TOTAL
	1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	
0.00 - .49	2	2	8	15	15	29	17	23	38	23	29	38	13	252
.50 - .99	2	13	48	71	82	69	21	61	38	34	65	31	4	539
1.00 - 1.49	.	.	.	44	48	21	15	17	15	8	19	4	4	195
1.50 - 1.99	.	.	.	2	4	2	.	2	.	.	4	.	.	14
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	15	56	132	149	121	53	103	91	65	117	73	21	

(Continued)

MONTH OCT
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	4	.	4	16	13	14	11	18	31	27	41	23	13	215
.50 - .99	.	5	25	68	81	20	22	29	72	40	41	31	7	441
1.00 - 1.49	.	.	2	38	54	43	7	16	13	31	32	32	5	273
1.50 - 1.99	.	.	.	2	13	4	2	2	2	9	11	9	9	63
2.00 - 2.49	.	.	.	.	.	2	.	.	.	.	4	4	.	10
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	4	5	31	124	161	83	42	65	118	107	129	99	34	

MONTH NOV
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	4	2	19	19	15	15	10	19	13	25	44	36	8	229
.50 - .99	2	8	51	99	103	67	27	25	23	34	21	30	10	500
1.00 - 1.49	.	.	.	29	68	38	6	2	4	8	29	34	8	226
1.50 - 1.99	.	.	.	.	4	8	.	2	4	8	15	8	.	49
2.00 - 2.49	.	.	.	.	.	.	.	.	2	.	.	.	.	2
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	6	10	70	147	190	128	43	48	46	75	109	108	26	

MONTH DEC
PERCENT OCCURRENCE(X10) OF HEIGHT AND PERIOD

HEIGHT(METERS)	PERIOD(SECONDS) 1.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	7.0- 7.9	8.0- 8.9	9.0- 9.9	11.0- 10.9	11.0- 11.9	12.0- 13.9	14.0- 16.9	17.0- LONGER	TOTAL
0.00 - .49	.	6	14	28	18	14	6	22	43	36	24	59	26	296
.50 - .99	.	16	51	99	128	39	24	32	34	26	45	6	14	514
1.00 - 1.49	.	.	10	28	67	26	.	16	8	8	16	2	.	181
1.50 - 1.99	.	.	.	.	.	.	.	2	.	4	8	.	.	14
2.00 - 2.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2.50 - 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.00 - 3.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
3.50 - 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.00 - 4.49	.	.	.	.	.	.	.	.	.	.	.	.	.	0
4.50 - 4.99	.	.	.	.	.	.	.	.	.	.	.	.	.	0
5.00 - GREATER	.	.	.	.	.	.	.	.	.	.	.	.	.	0
TOTAL	0	22	75	155	213	79	30	72	85	74	93	67	40	

(Sheet 4 of 4)

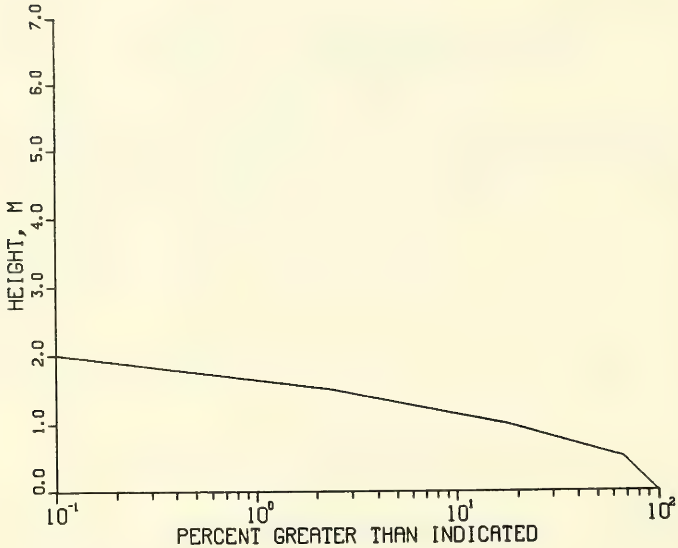


Figure B41. 1980 through 1984 annual cumulative distribution of H_{m_o} for gage 615

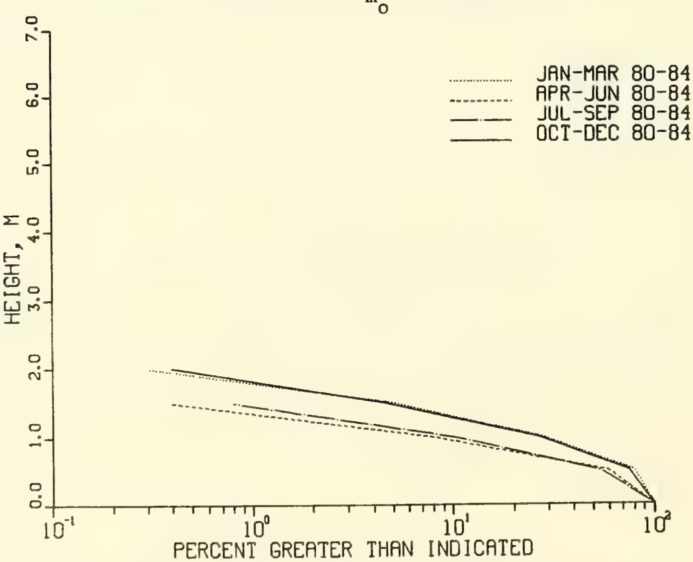
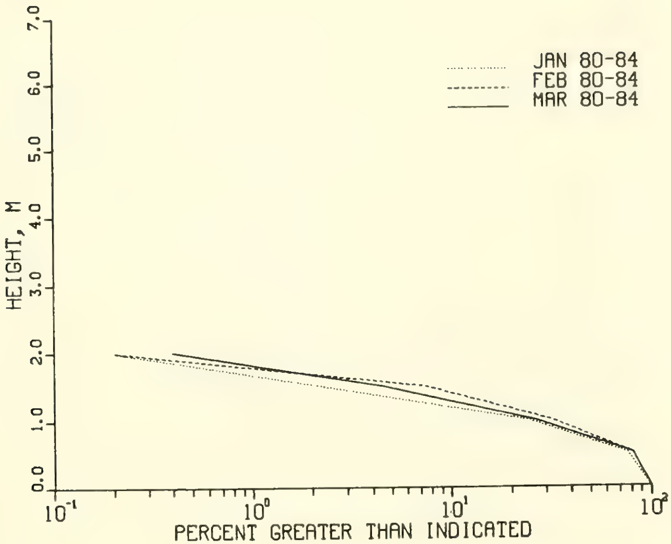


Figure B42. 1980 through 1984 seasonal cumulative distribution of H_{m_o} for gage 615



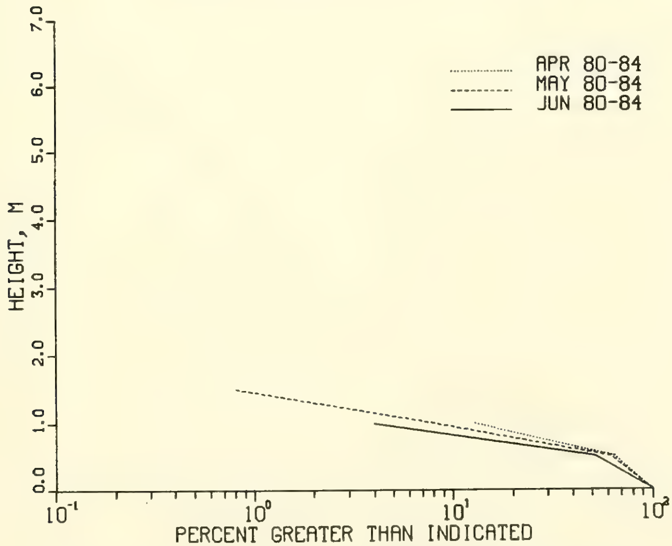
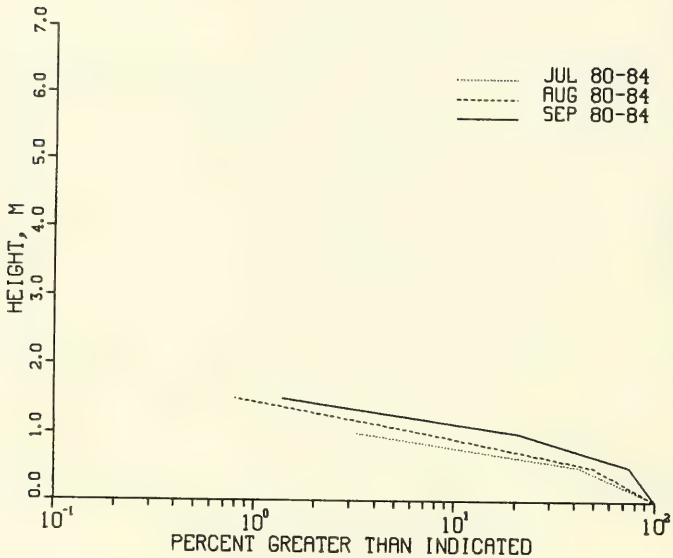


Figure B43. 1980 through 1984 monthly cumulative distribution of H_{m_o} for gage 615 (Continued)



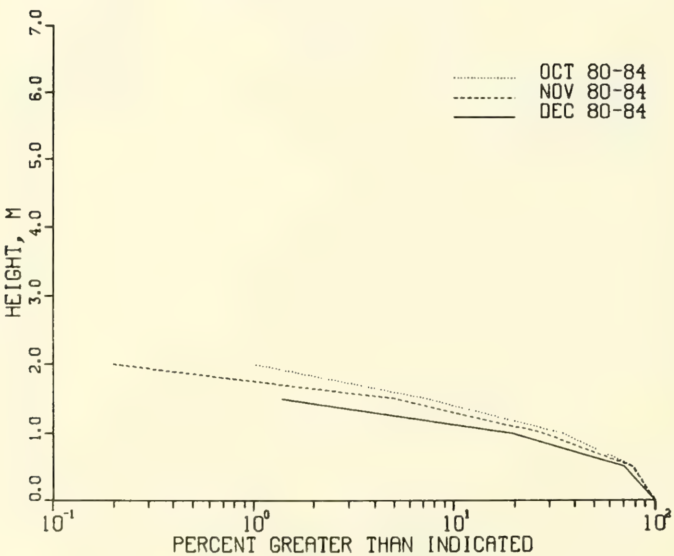


Figure B43. (Concluded)

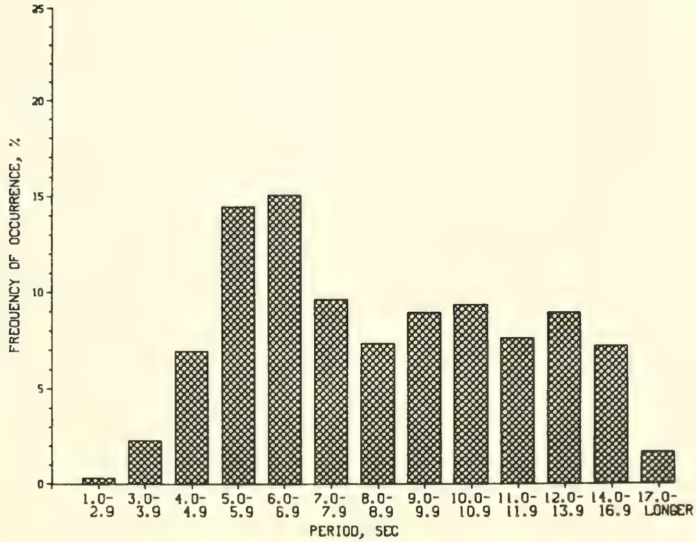


Figure B44. 1980 through 1984 annual distribution of T_p for gage 615

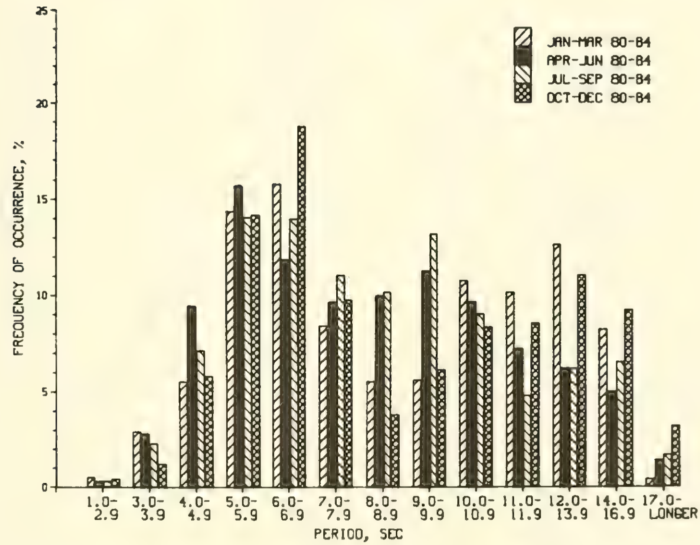


Figure B45. 1980 through 1984 seasonal distribution of T_p for gage 615

Table B31

1980 Through 1984 Persistence of H_{m_o} for Gage 615

Height m	Consecutive Day(s) or Longer																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	33
0.5	39	33	29	24	20	16		13	10	9			6													2
1.0	39	25	15	9	6			3																		
1.5	10	5		2																						
2.0																										
2.5																										
3.0																										
3.5																										
4.0																										

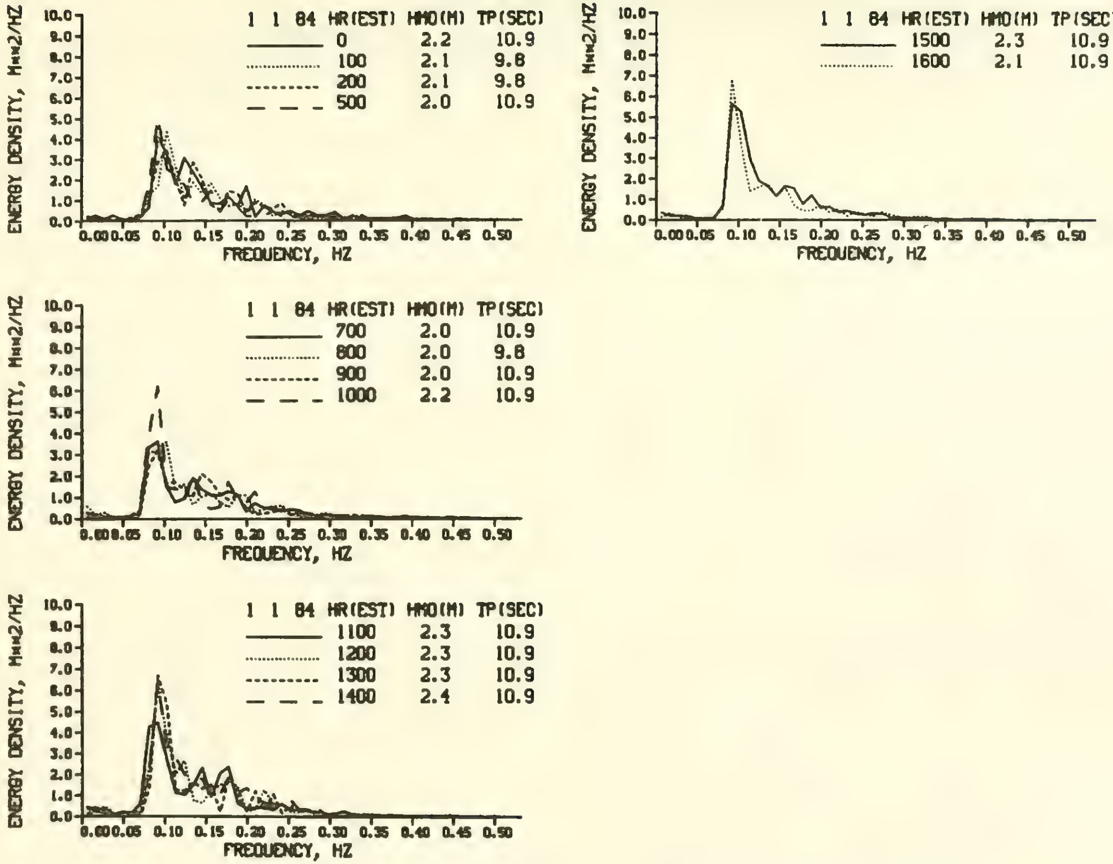


Figure B46. Spectra for waves >2 m, gage 625 (Sheet 1 of 14)

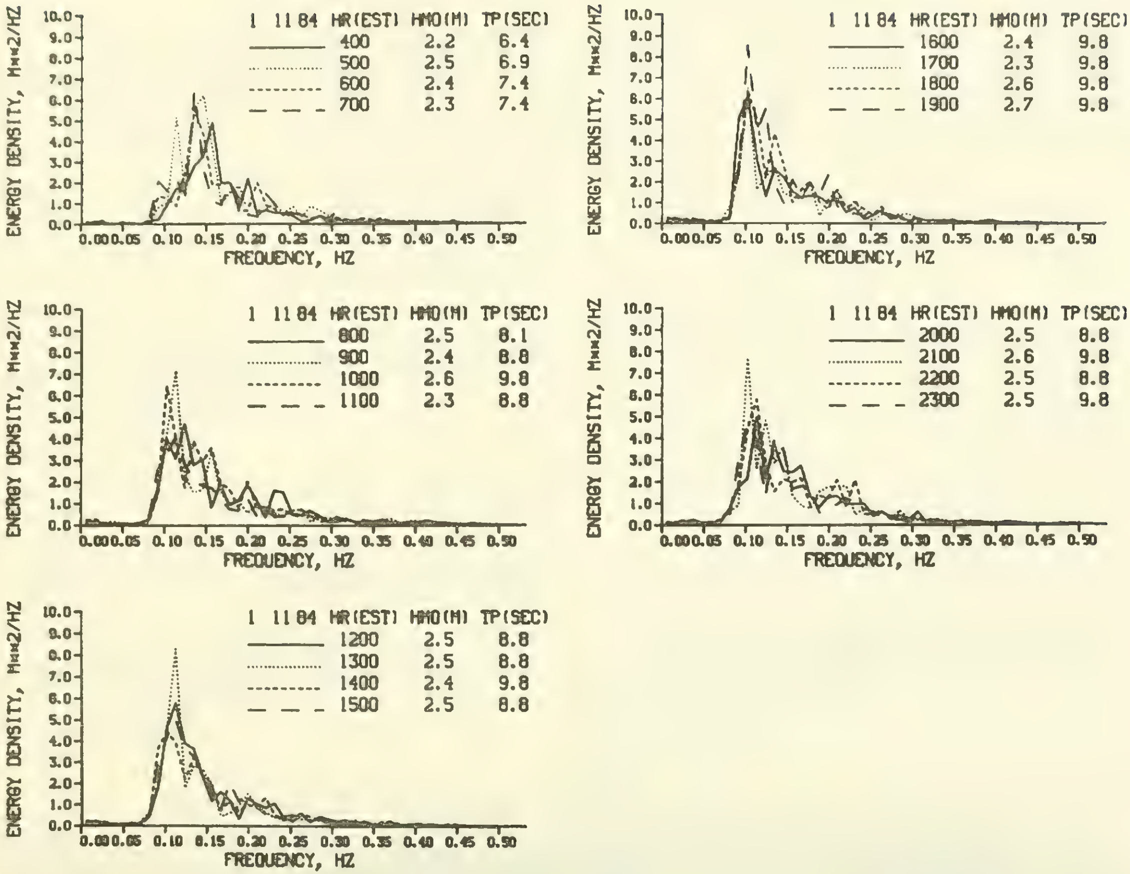


Figure B46. (Sheet 2 of 14)

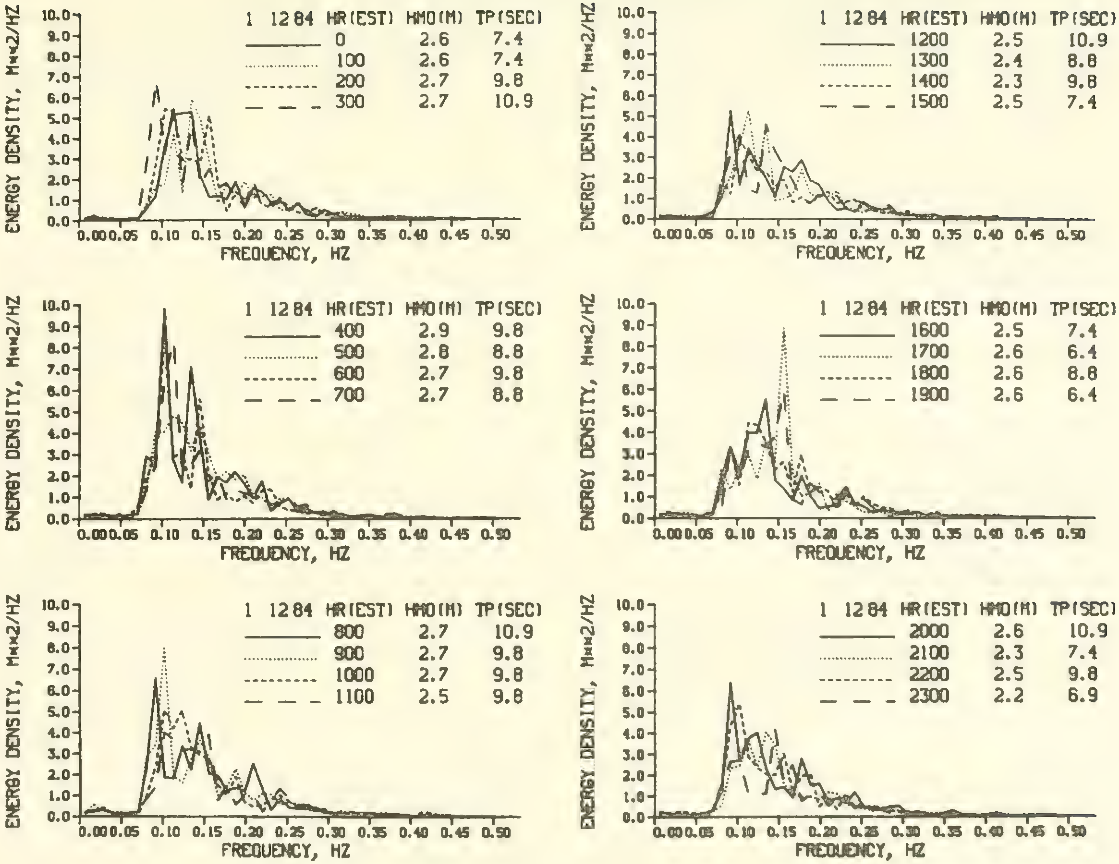
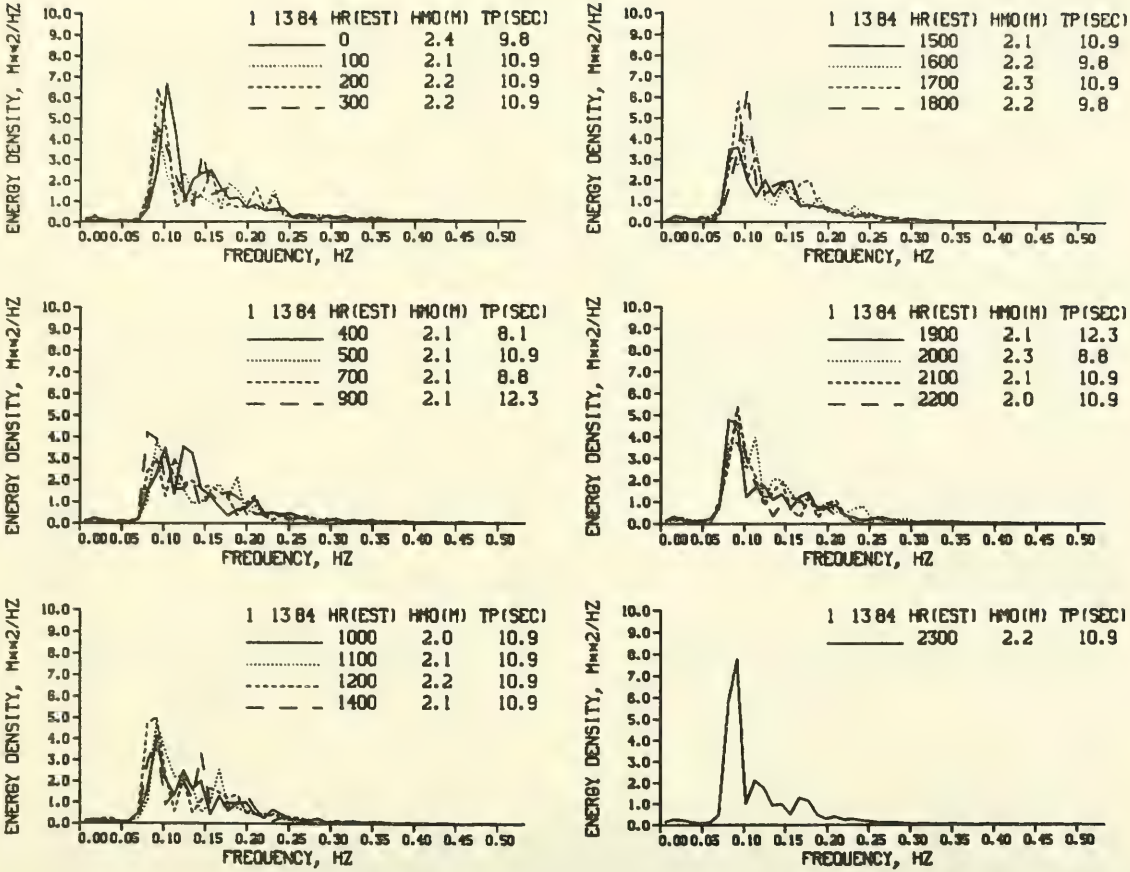


Figure B46. (Sheet 3 of 14)



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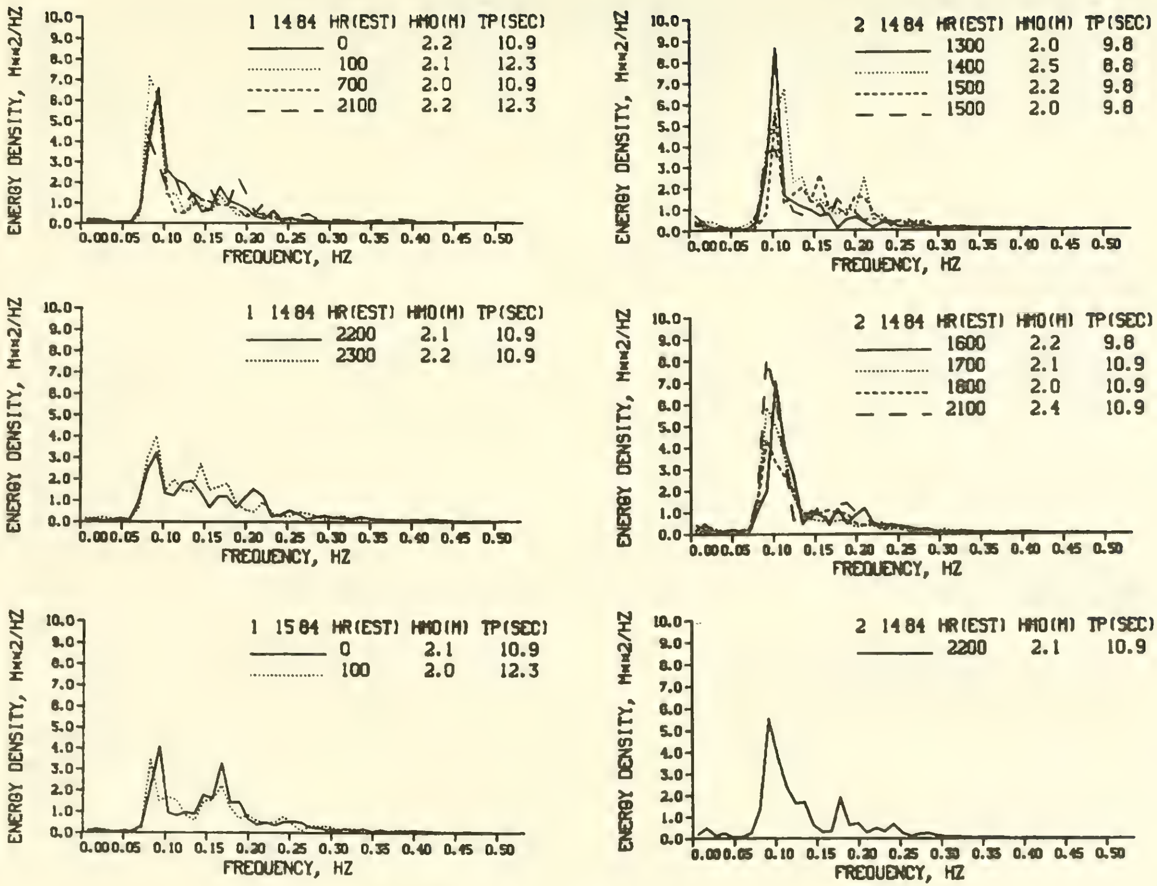

Figure B46. (Sheet 5 of 14)

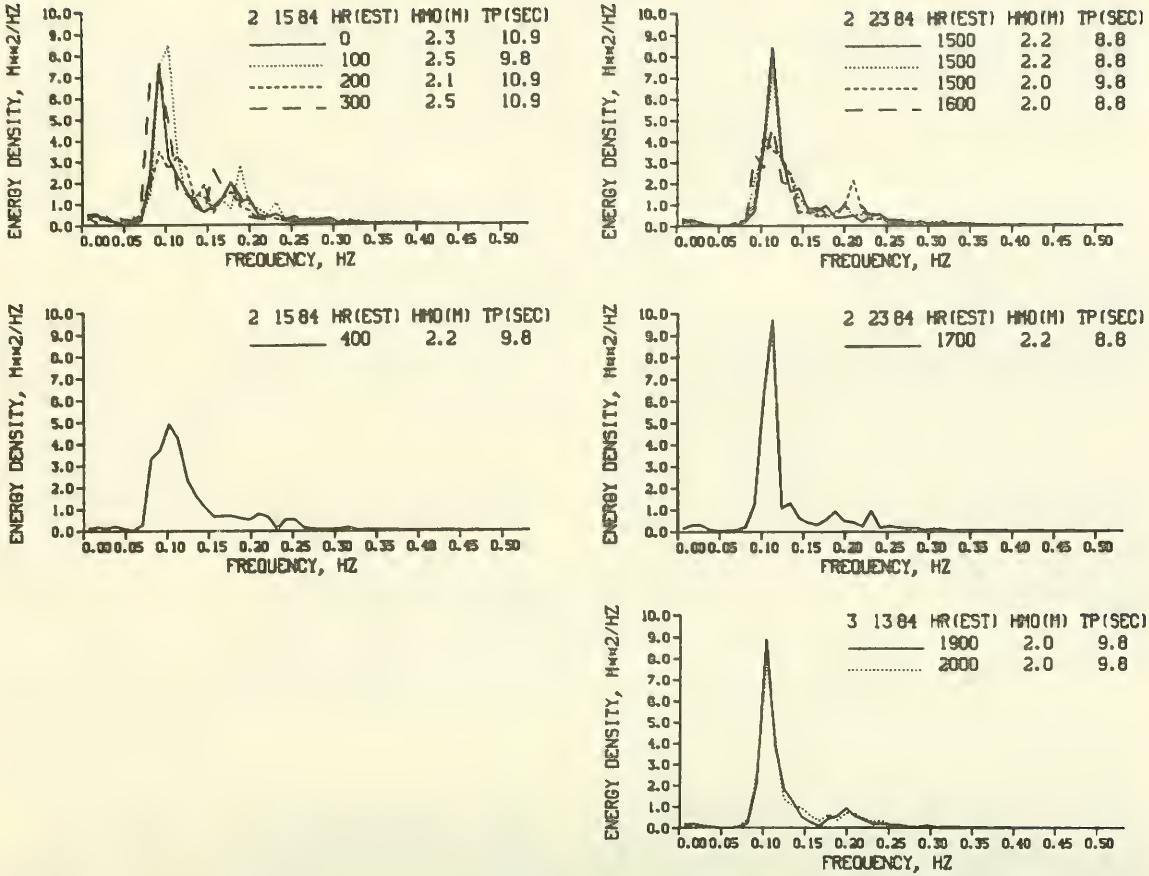

Figure B46. (Sheet 6 of 14)

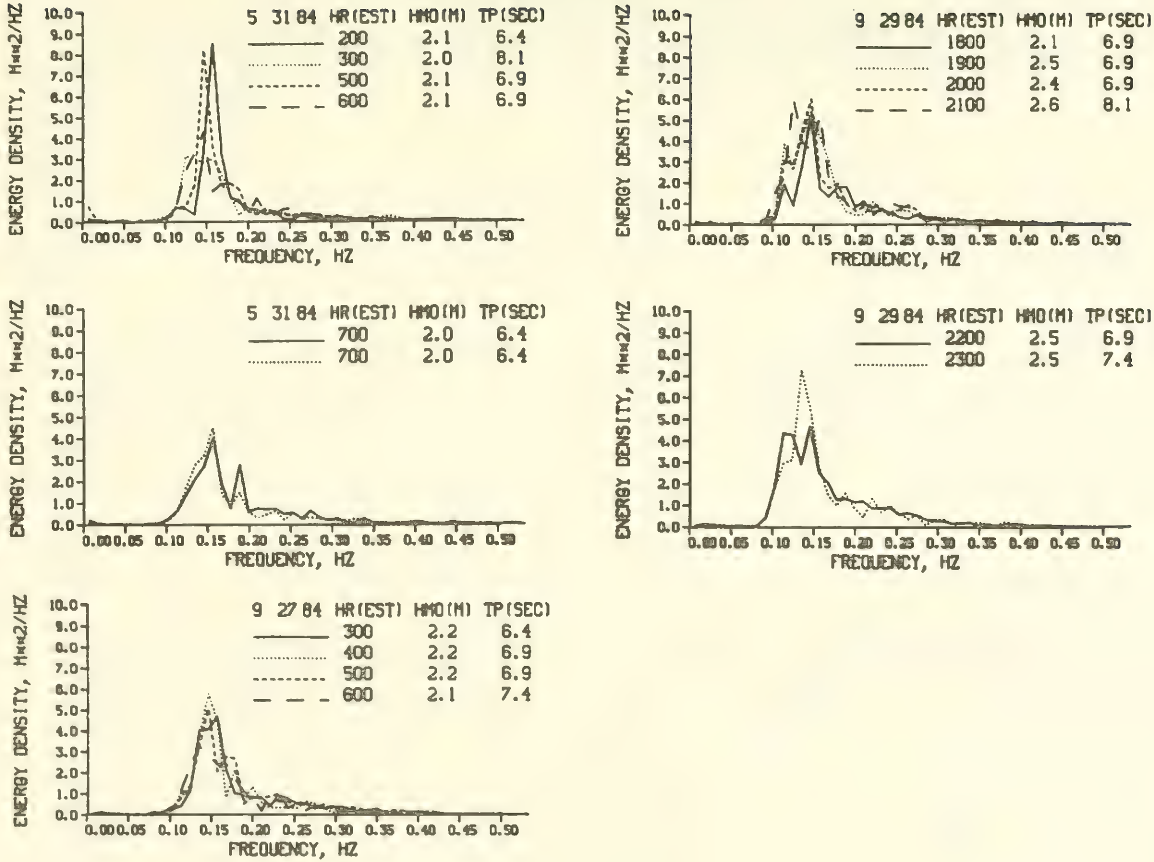

Figure B46. (Sheet 7 of 14)

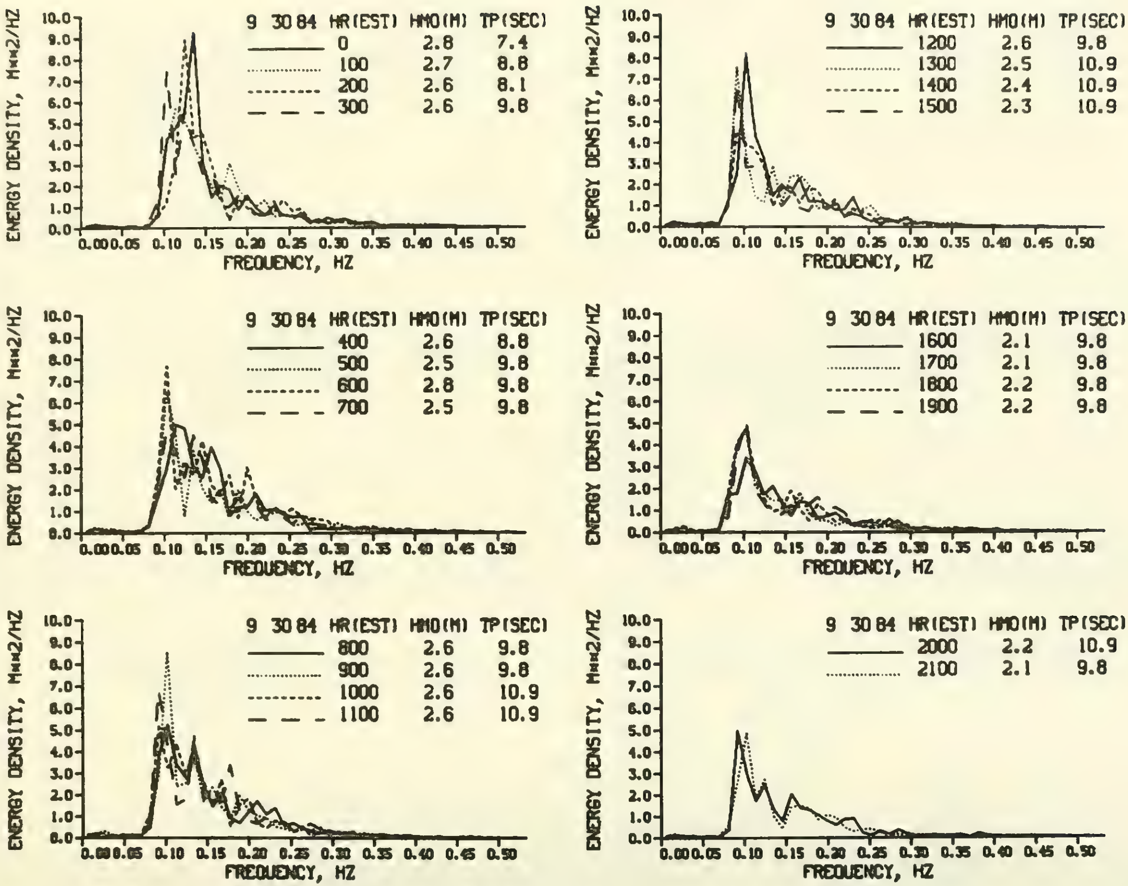

Figure B46. (Sheet 8 of 14)

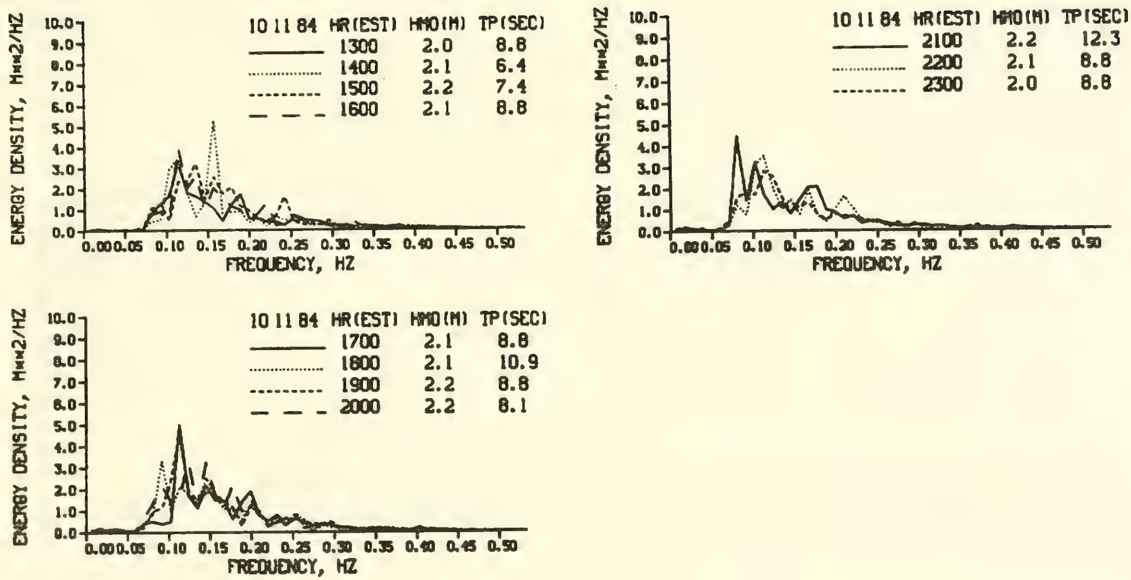

Figure B46. (Sheet 9 of 14)

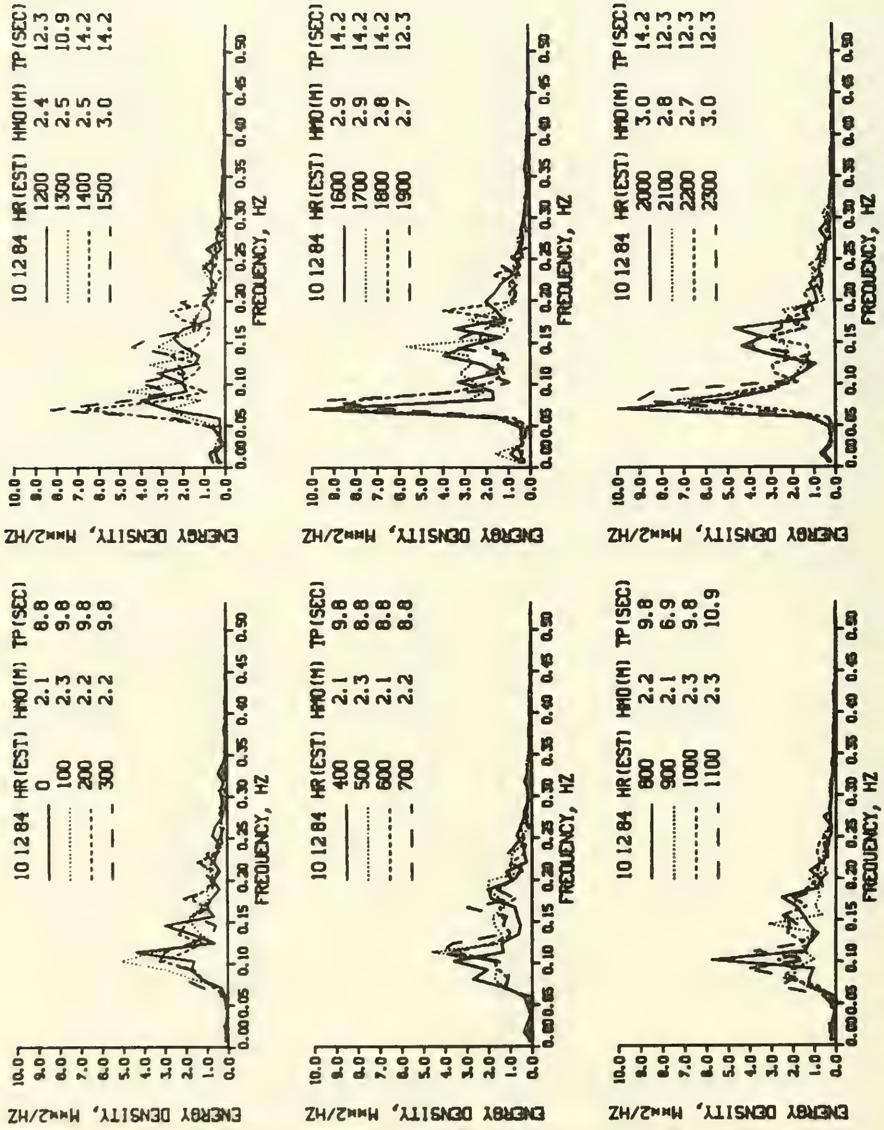

Figure B46. (Sheet 10 of 14)

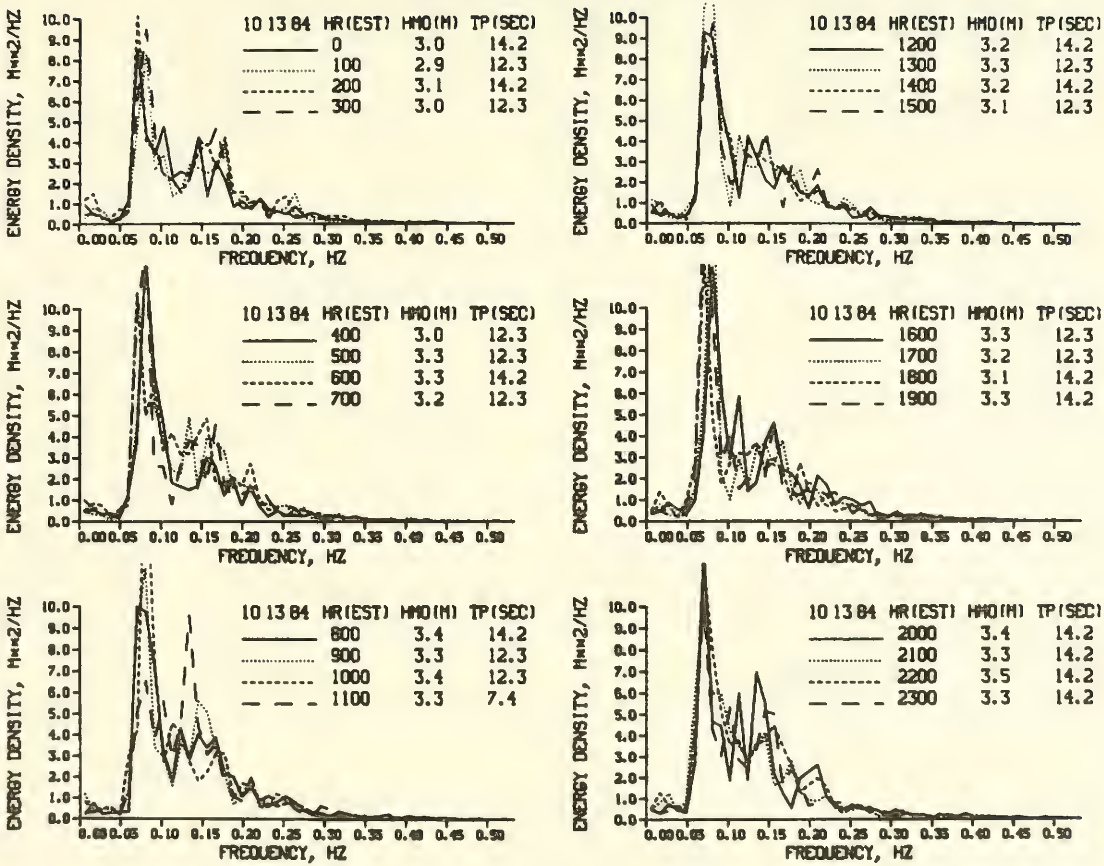

Figure B46. (Sheet 11 of 14)

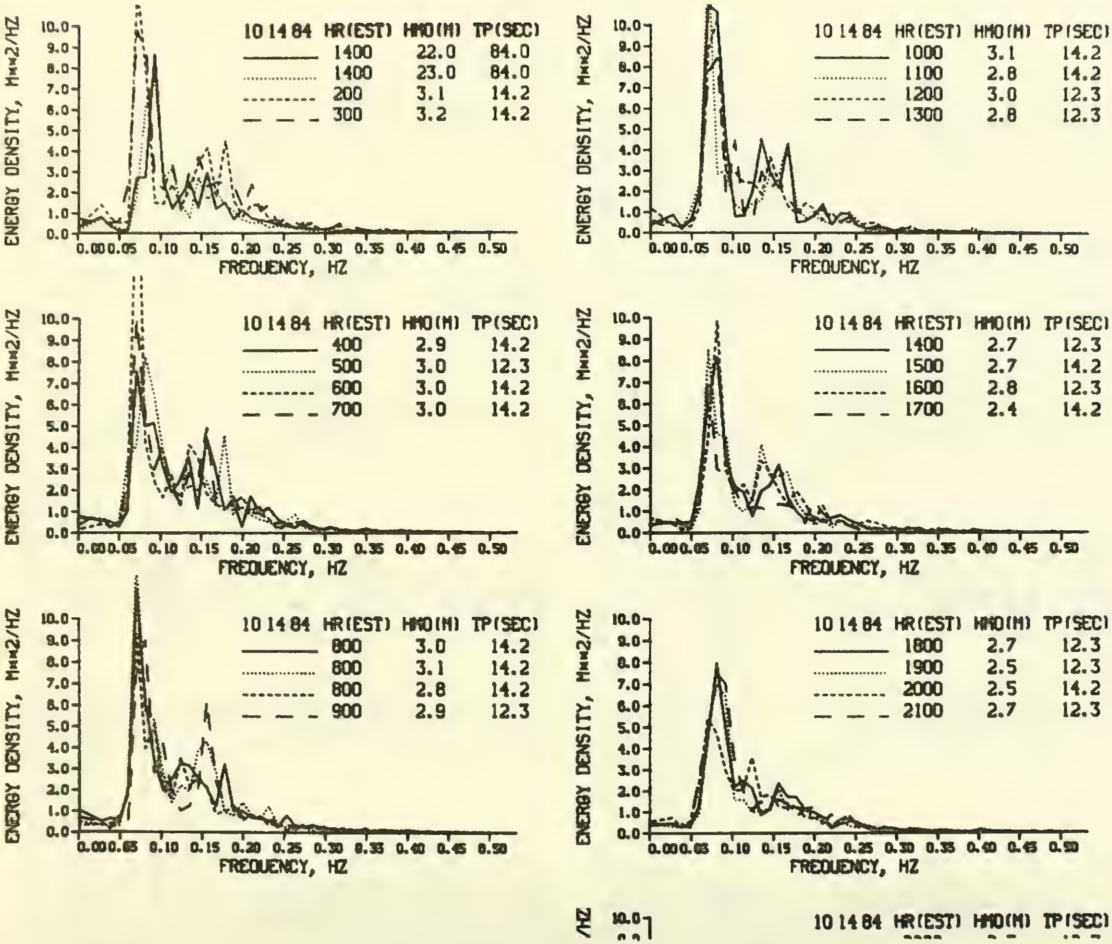

Figure B46. (Sheet 12 of 14)

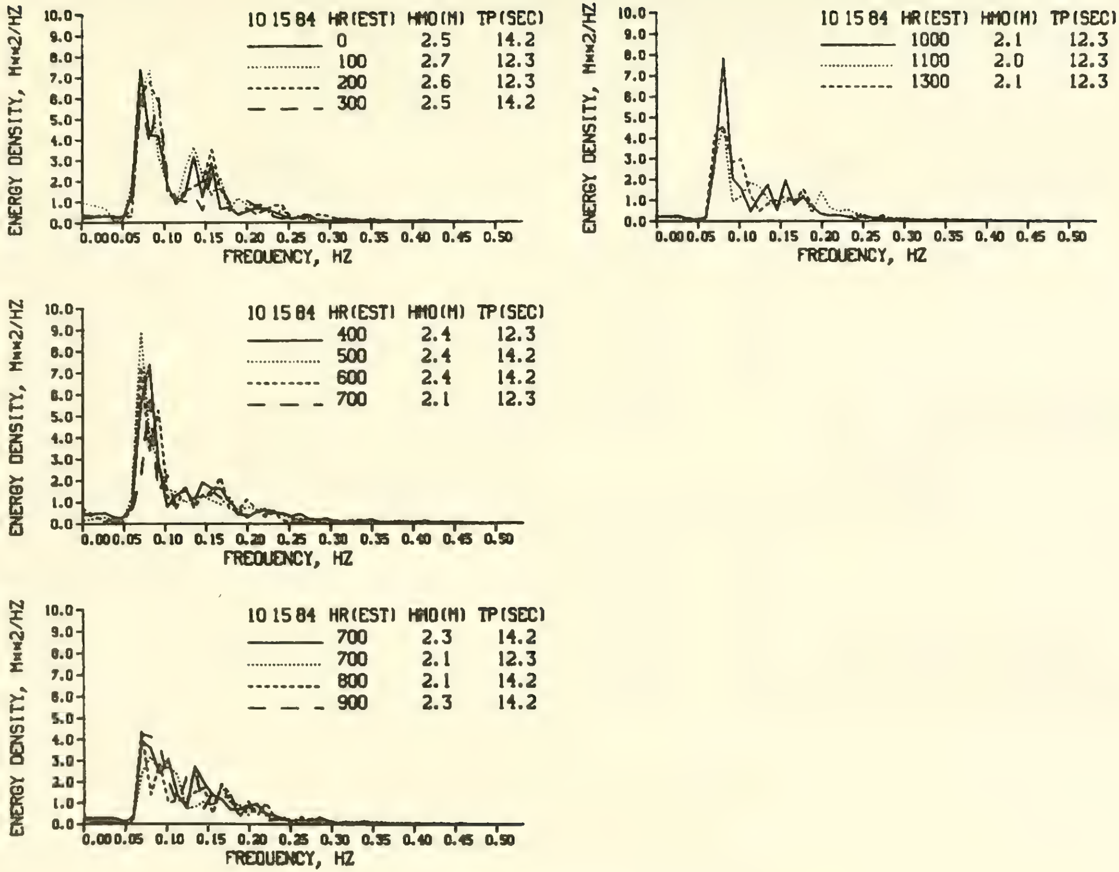

Figure B46. (Sheet 13 of 14)

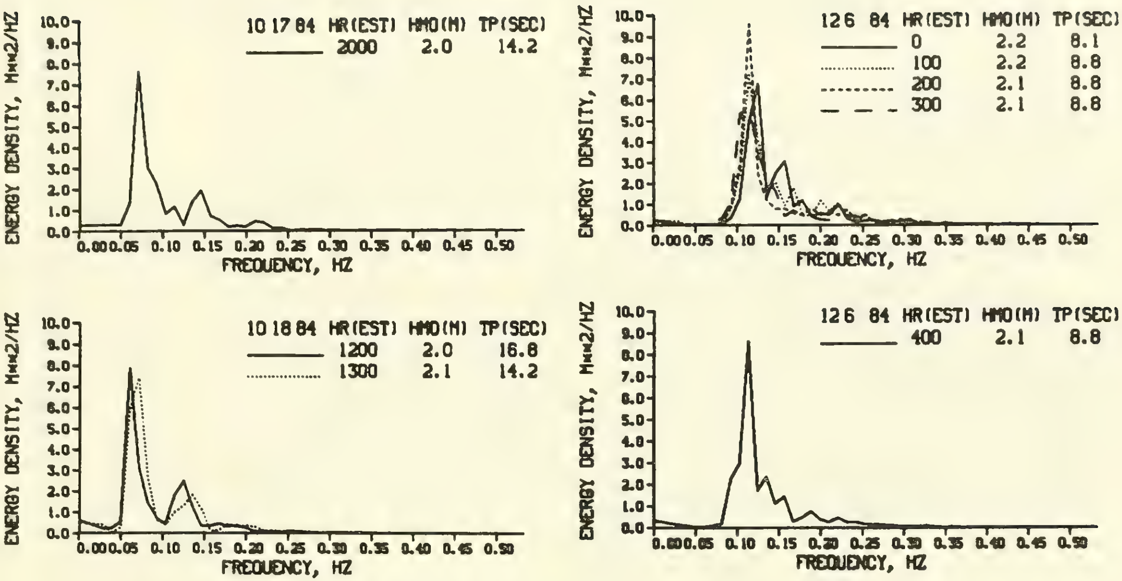

Figure B46. (Sheet 14 of 14)

APPENDIX C: SURVEY DATA

Contour diagrams constructed from the bathymetric survey data are presented in this appendix. The profile lines surveyed are identified on each diagram. Contours are in half metres referenced to National Geodetic Vertical Datum. The distance offshore is referenced to the Field Research Facility (FRF) monumentation baseline behind the dune.

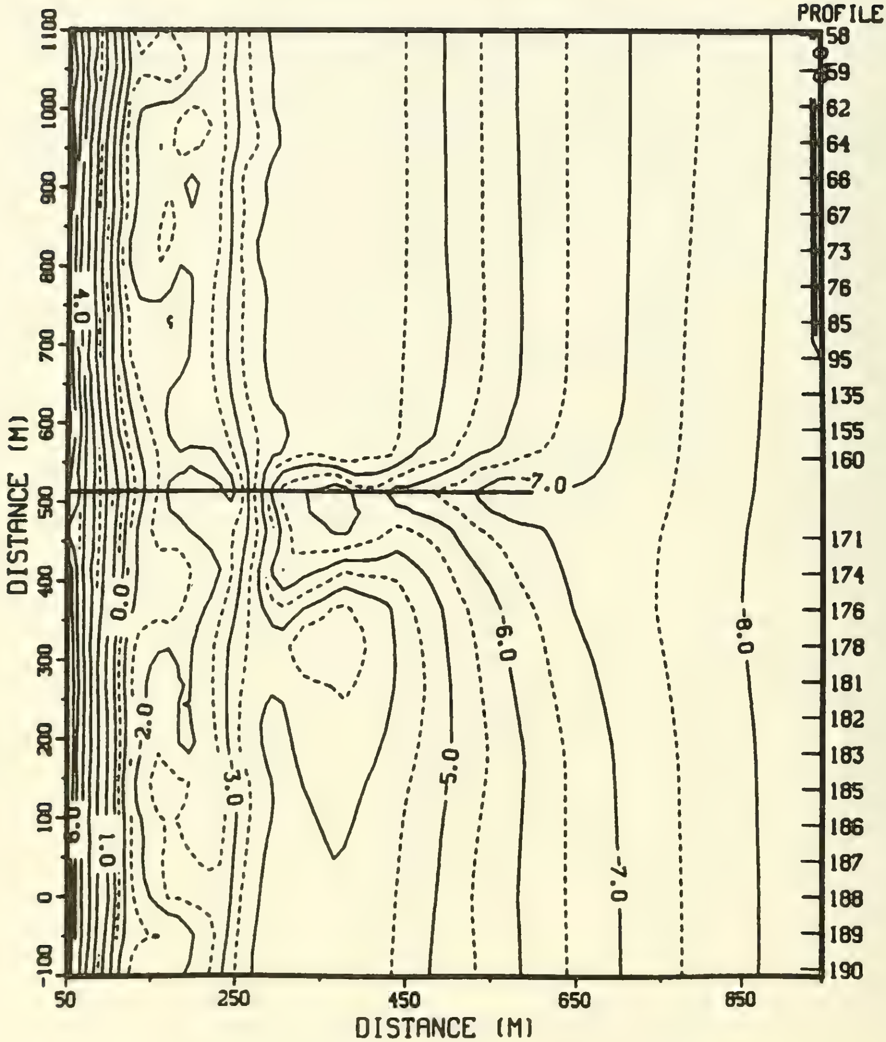

Figure C1. FRF bathymetry, 5 January 1984
(contours in metres)

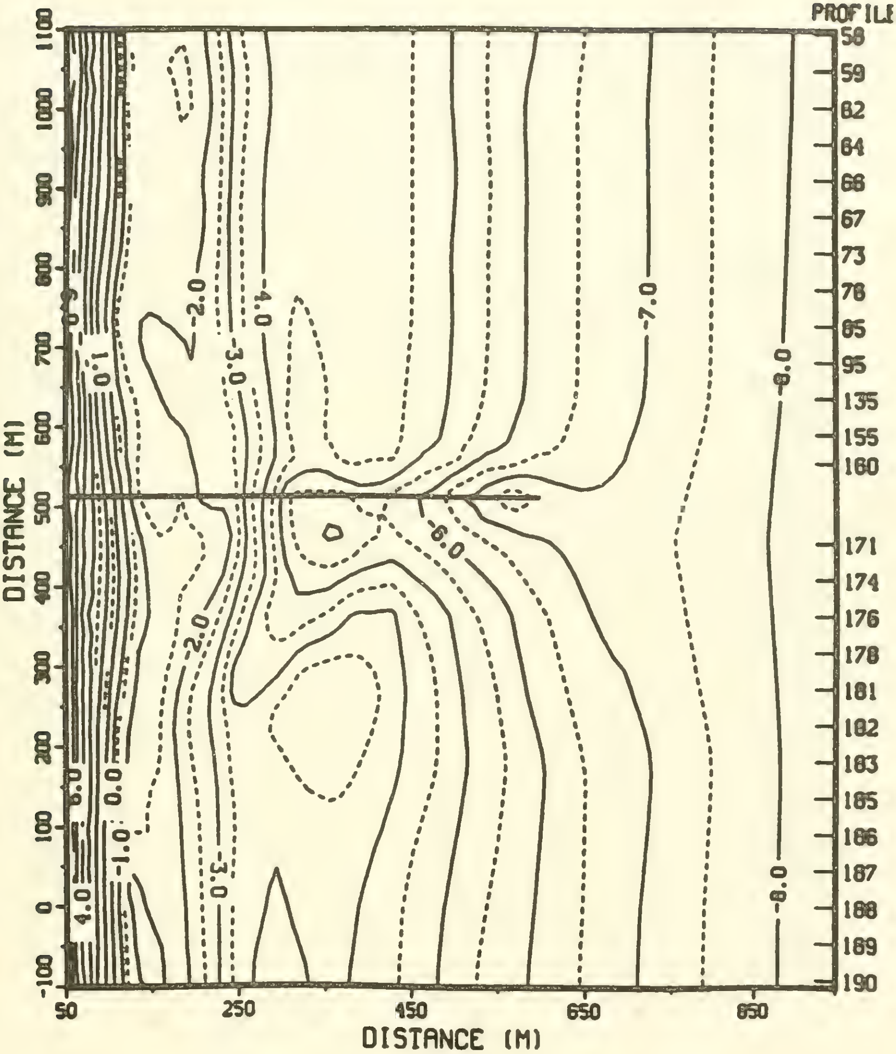

Figure C2. FRF bathymetry, 9 February 1984
(contours in metres)

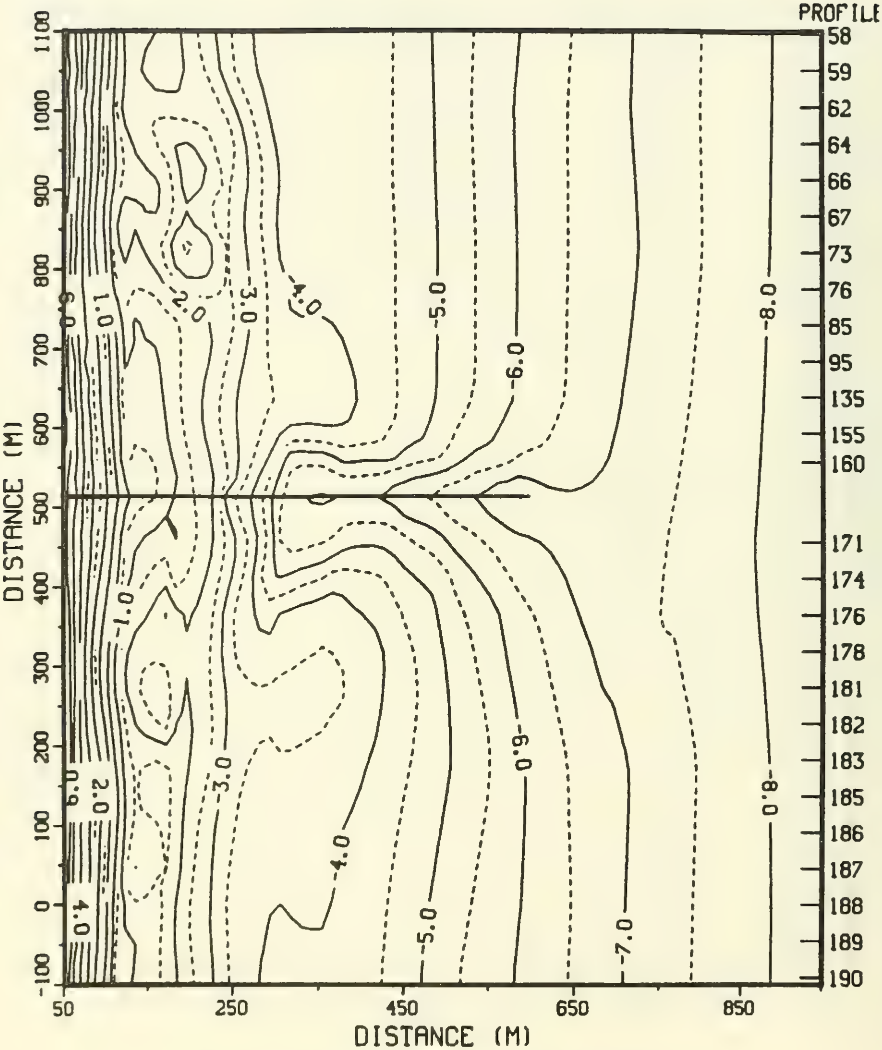

Figure C3. FRF bathymetry, 2 April 1984
(contours in metres)

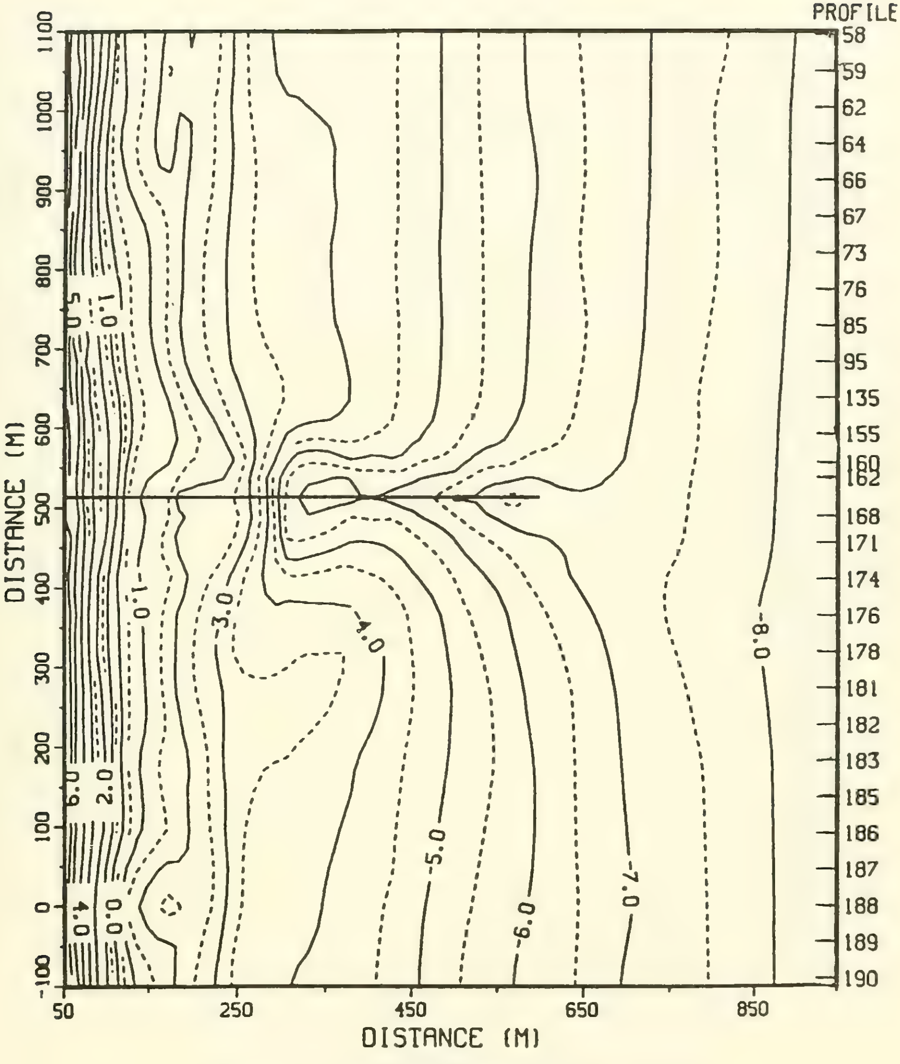

Figure C4. FRF bathymetry, 14 May 1984
(contours in metres)

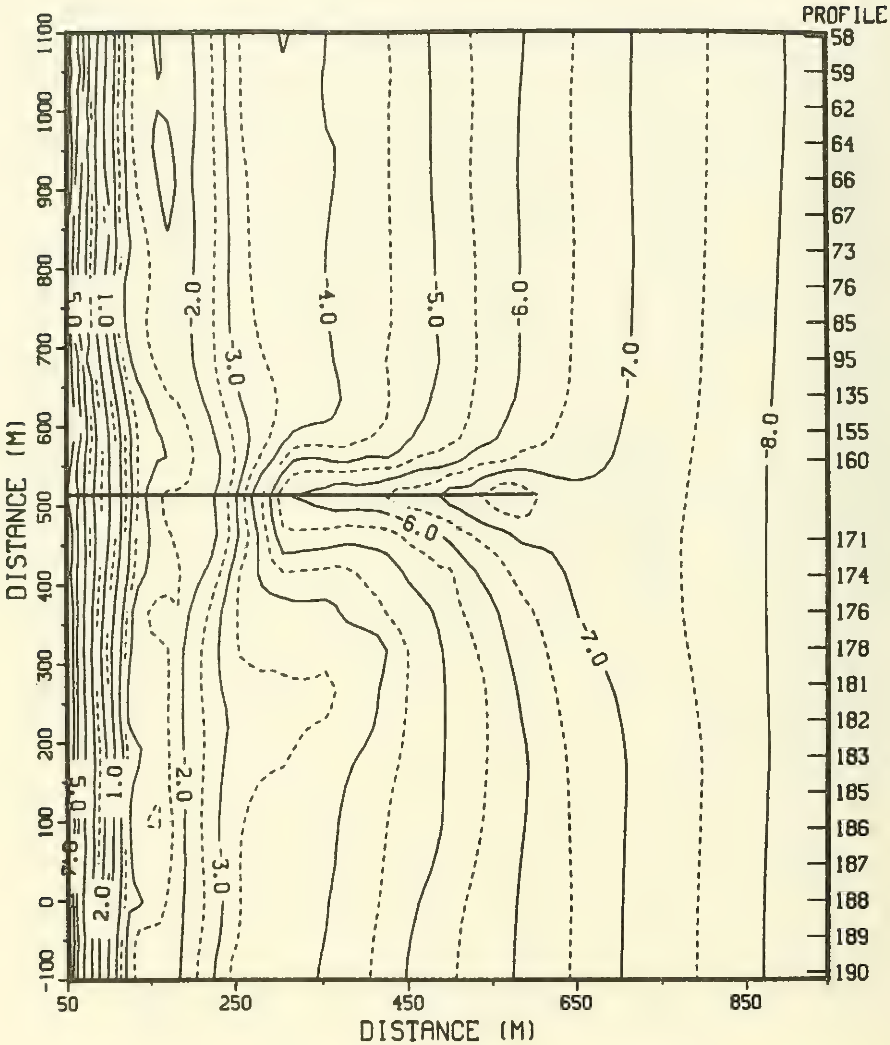

Figure C5. FRF bathymetry, 13 June 1984 (contours in metres)

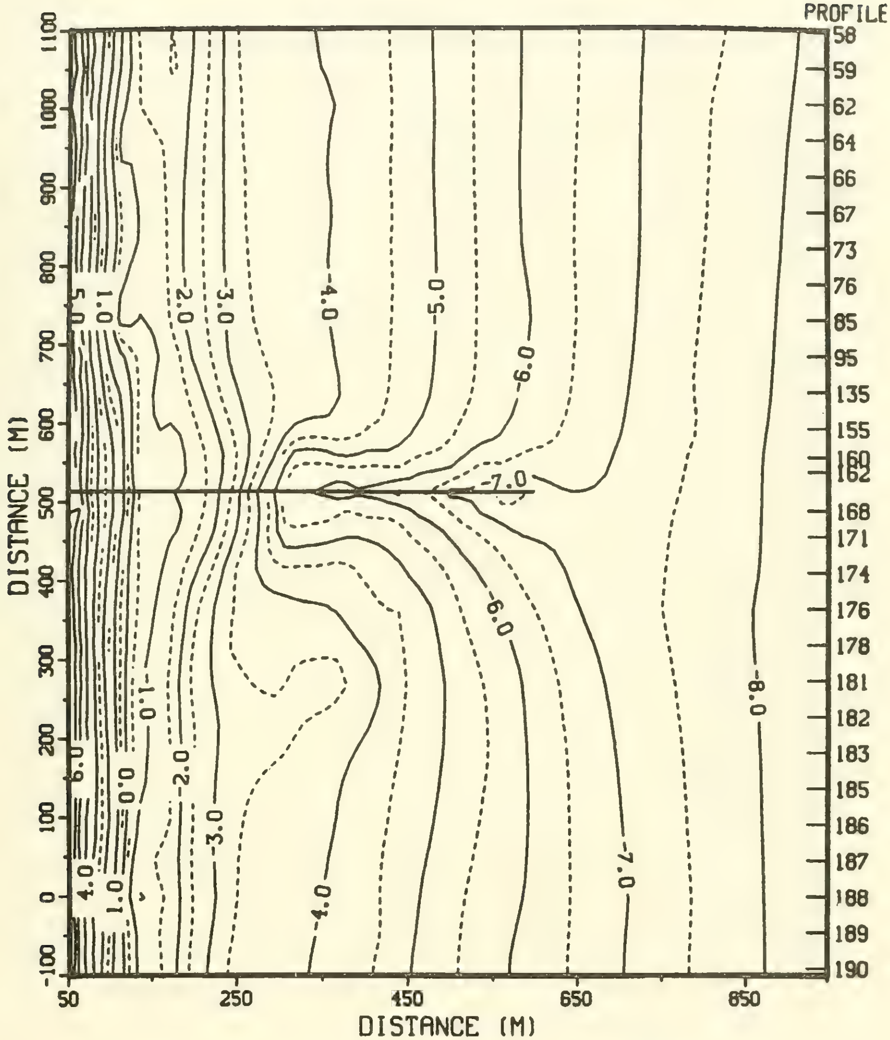

Figure C6. FRF bathymetry, 9 July 1984
(contours in metres)

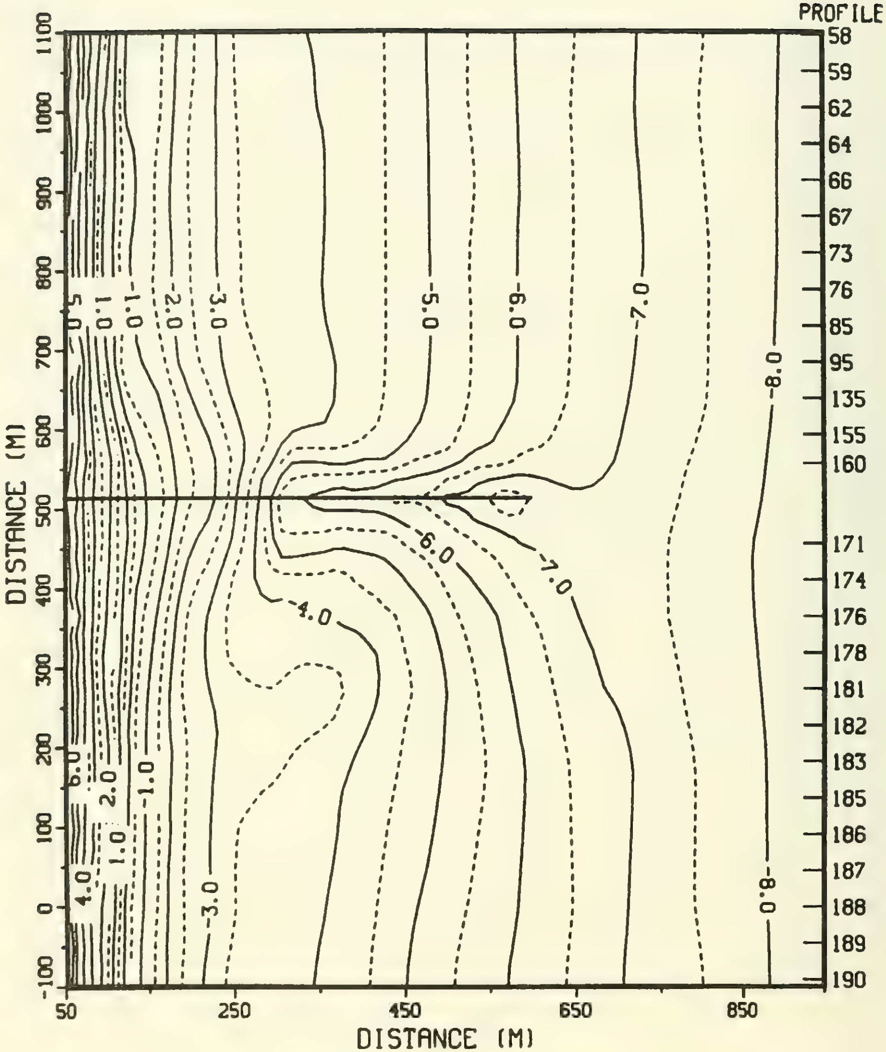

Figure C7. FRF bathymetry, 11 August 1984
(contours in metres)

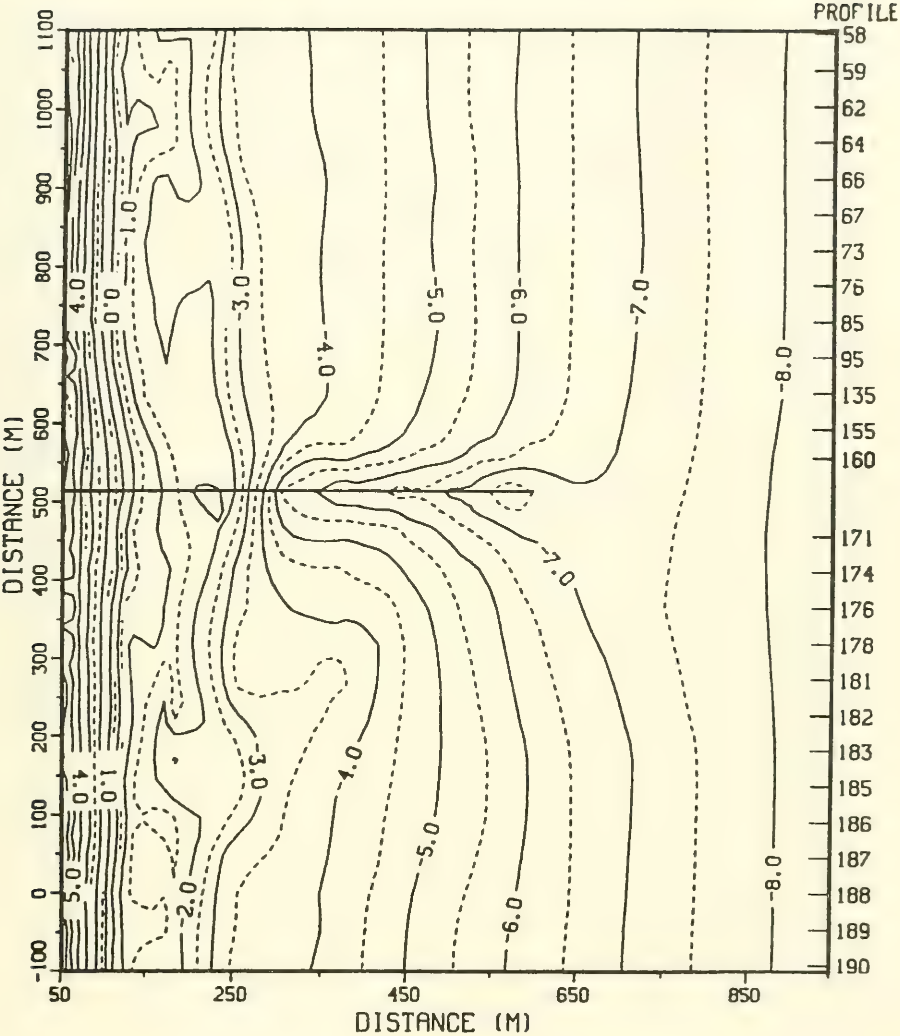

Figure C8. FRF bathymetry, 20 September 1984
(contours in metres)

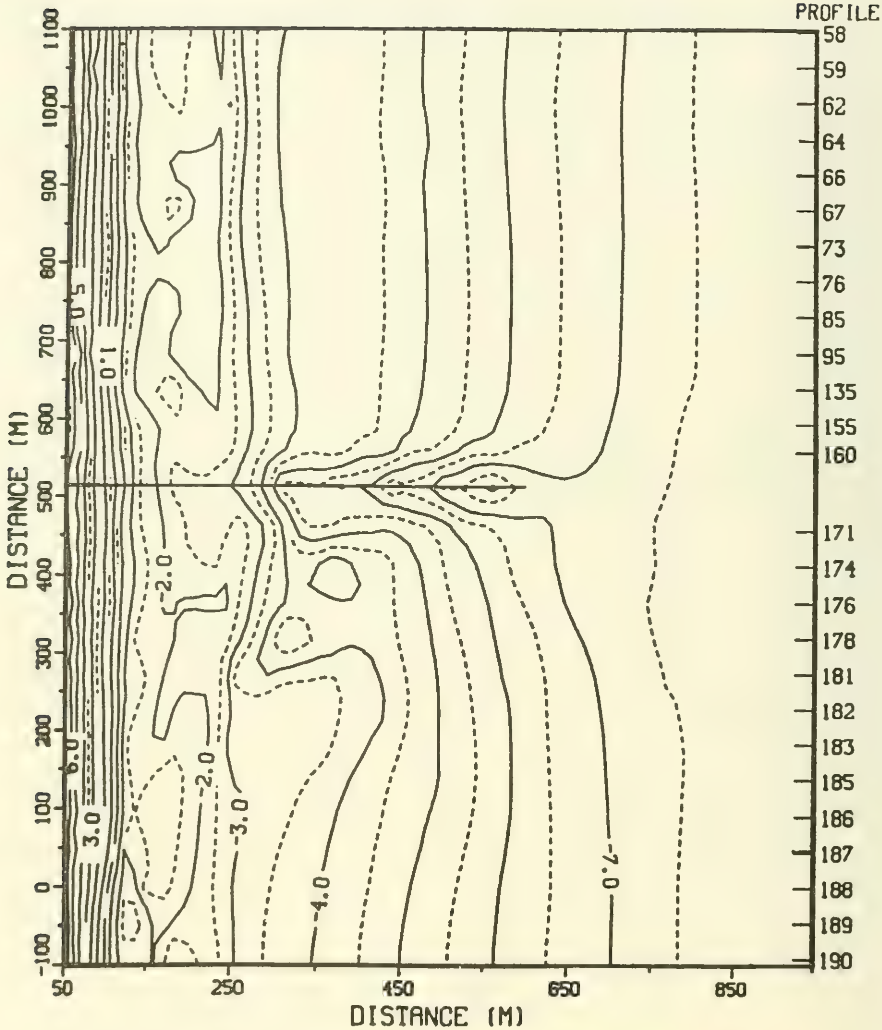

Figure C9. FRF bathymetry, 16 October 1984
(contours in metres)

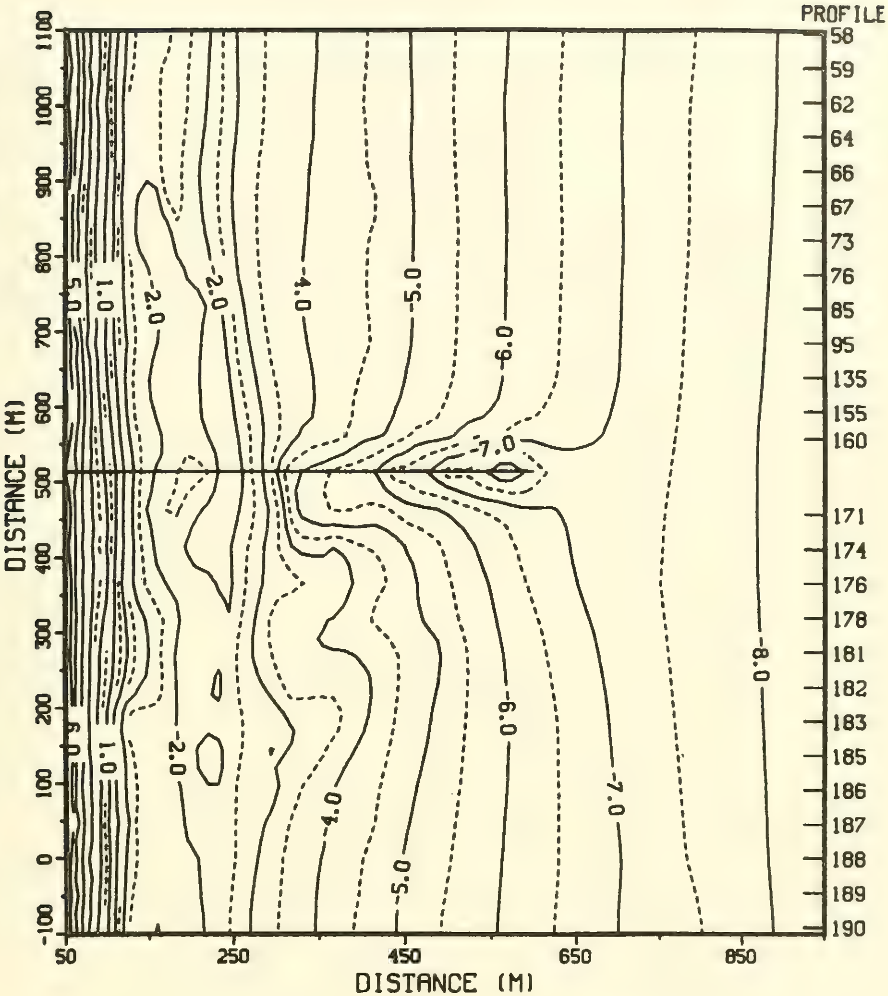

Figure C10. FRF bathymetry, 27 November 1984
(contours in metres)

APPENDIX D: STORM DATA

1. Whenever the wave height H_{m_o} exceeded 2 m at the seaward end of the Field Research Facility (FRF) pier, data were collected hourly. The available data for the 14 storms (reported in Part VI of the main text) are presented in Figures D1-D14.

Atmospheric Pressure

2. Reported in millibars, these data are useful for documenting the type of storm, the passage of fronts, and the intensity of the atmospheric pressure system.

Wind Speed

3. Local winds are generally responsible for the wave conditions at the FRF. Wind speed is reported in metres per second.

Wind Direction

4. Referenced to true (star) north, the wind direction indicates the directions from which the winds are blowing, e.g., winds blowing from west to east are referred to as having an angle of 270 deg.

Wave Direction

5. Referenced to true (star) north, the wave direction measurements are taken at the seaward end of the FRF pier. The pier axis (considered perpendicular to the beach at the FRF) is oriented 70 deg east of true north; consequently, wave angles greater than 70 deg imply the waves were coming from the south side of the pier.

Gage 625 H_{m_o}

6. The wave height, measured in metres, was that obtained from the Baylor wave staff located at the seaward end of the FRF pier.

Wave Period

7. The peak spectral wave period in seconds from gage 625 is reported.

Water Levels

8. Reported in centimetres and referenced to the National Geodetic Vertical Datum, the water levels were obtained from the National Ocean Services primary tide sta 865-1370 at the seaward end of the FRF pier.

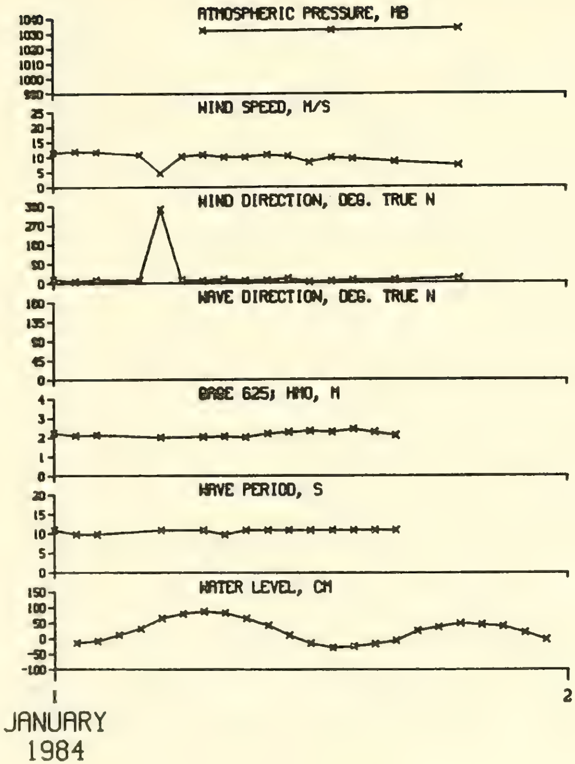

Figure D1. Storm data for 1 January 1984

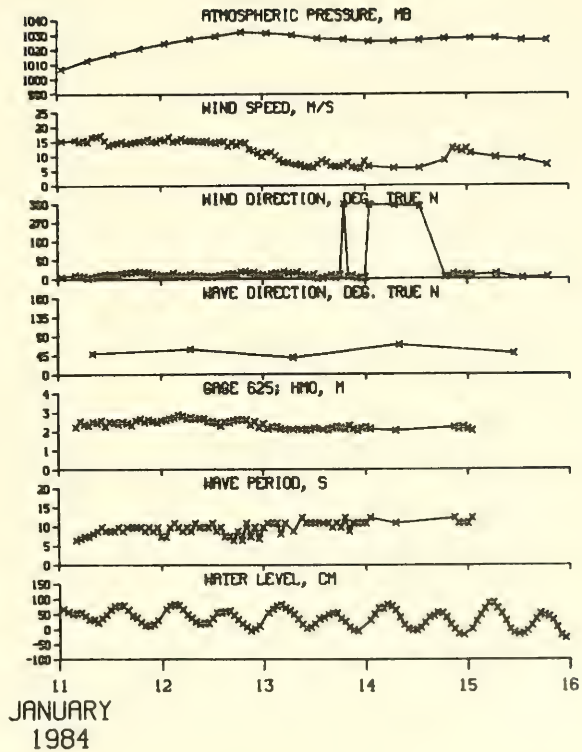

Figure D2. Storm data for 11-15 January 1984

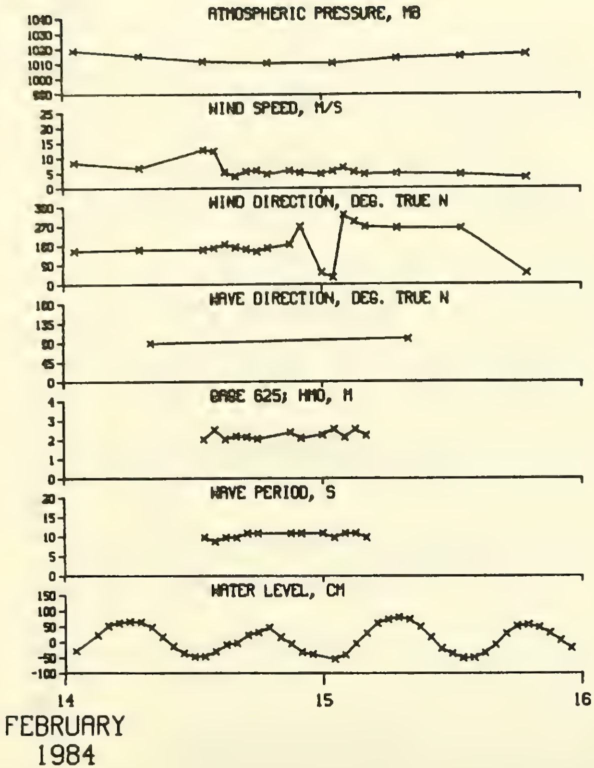

Figure D3. Storm data for 14-15 February 1984

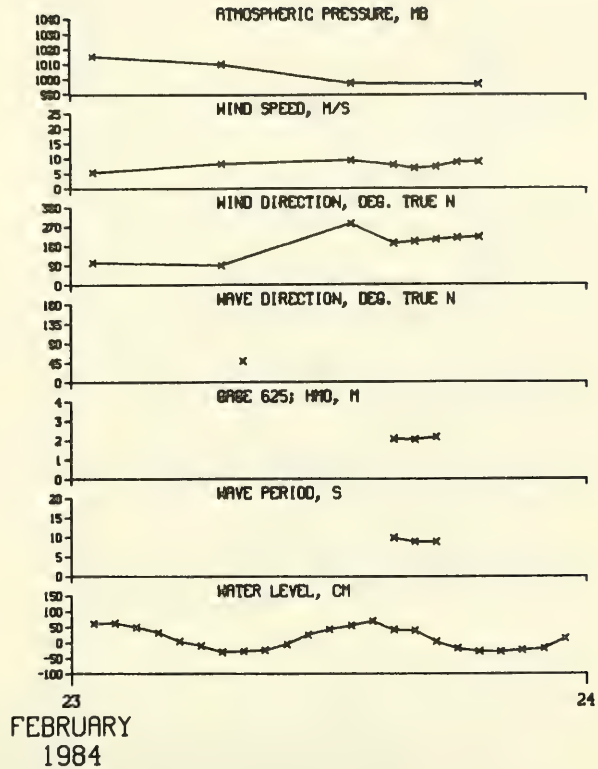

Figure D4. Storm data for 23 February 1984

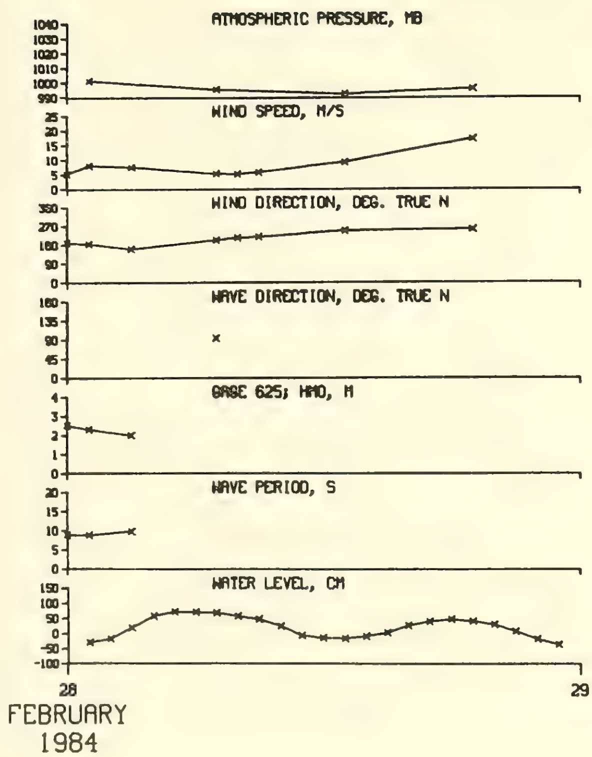

Figure D5. Storm data for 28 February 1984

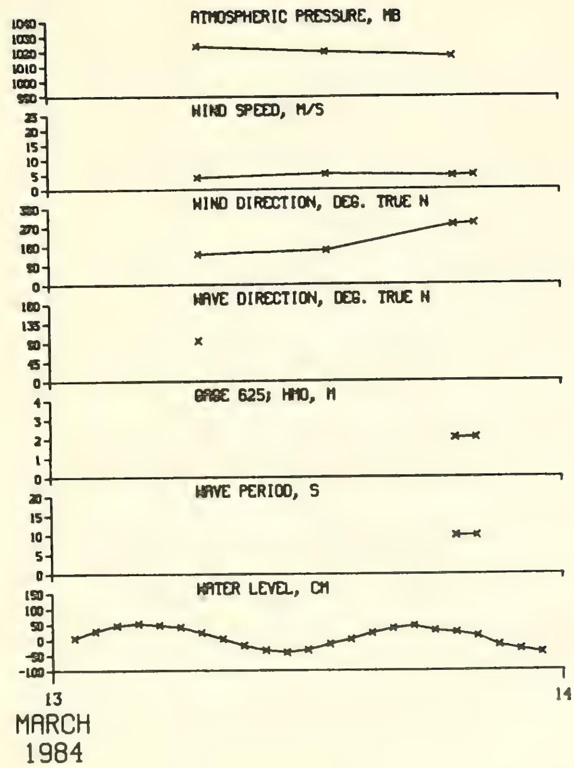

Figure D6. Storm data for 13 March 1984

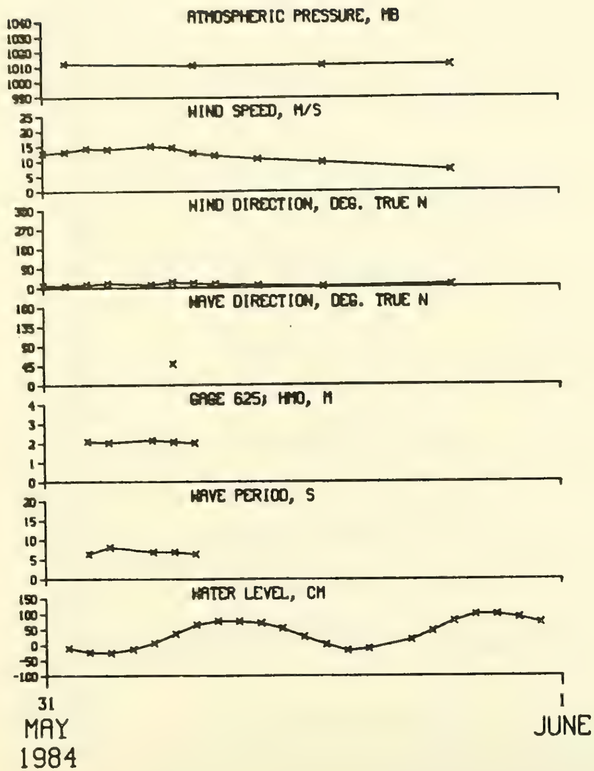

Figure D7. Storm data for 31 May 1984

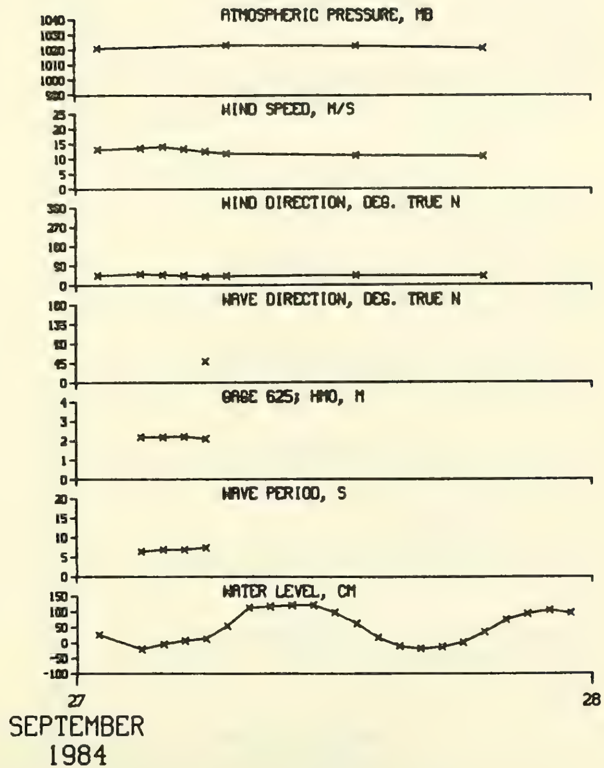

Figure D8. Storm data for 27 September 1984

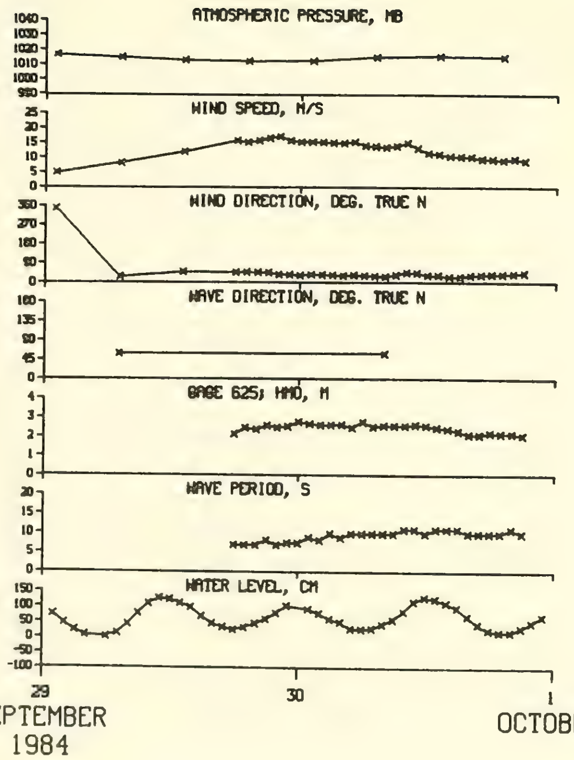

Figure D9. Storm data for 29-30 September 1984

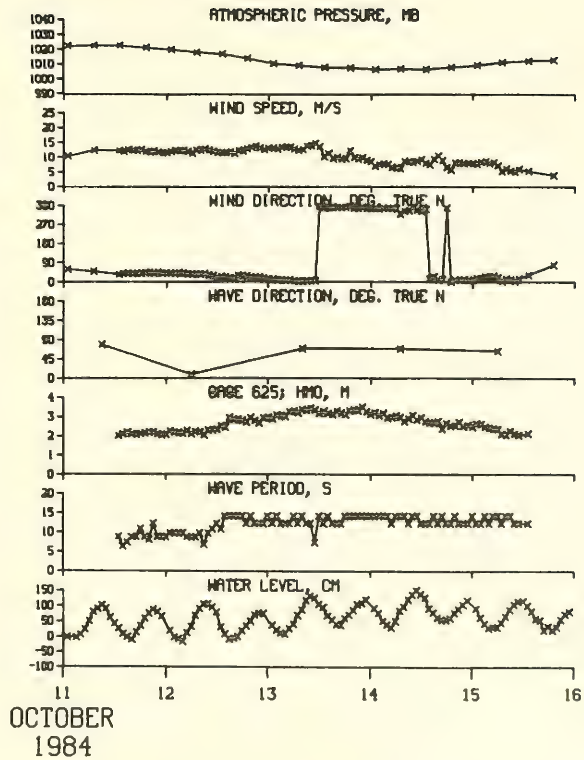

Figure D10. Storm data for 11-15 October 1984

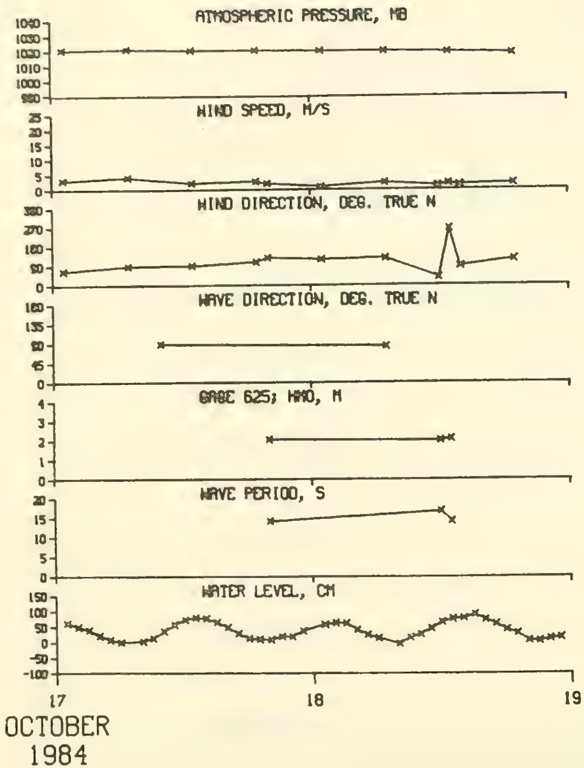

Figure D11. Storm data for 17-18 October 1984

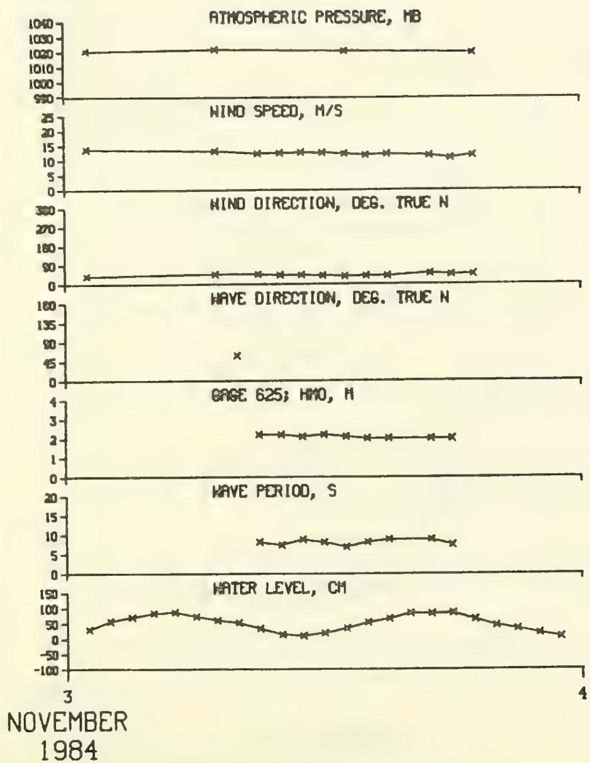

Figure D12. Storm data for 3 November 1984

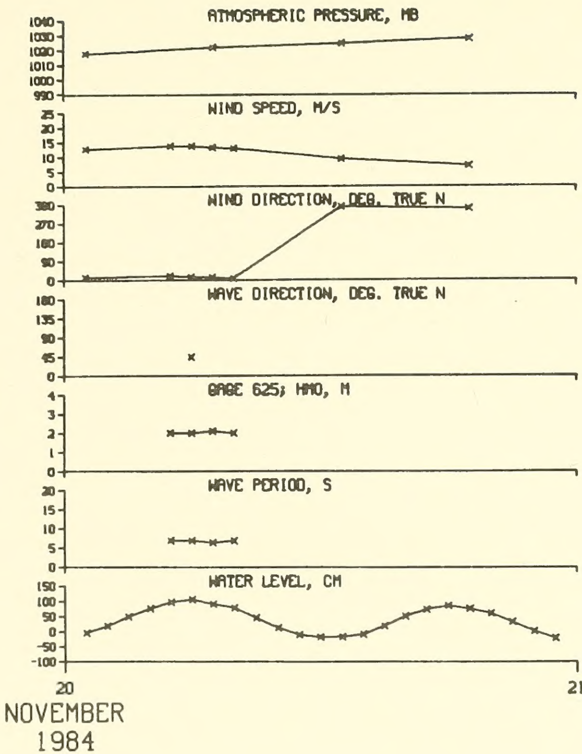

Figure D13. Storm data for 20 November 1984

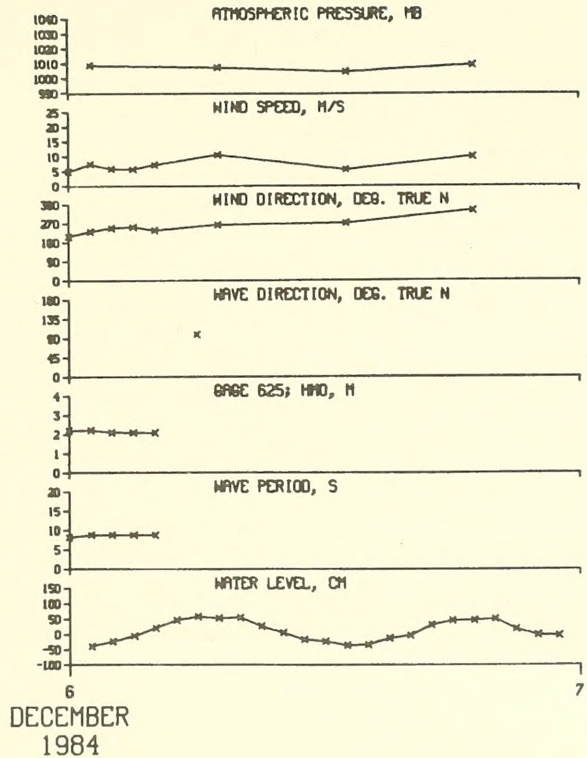

Figure D14. Storm data for 6 December 1984